

Standard use-wear chart of TUMRT (1): Microflaking (1)

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INTRODUCTION

The study of prehistoric lithic artifacts entails three fundamental realms of research, namely, typological, technological, and functional analysis. All these areas need to establish robust methods of meaning assignment to any observed patterns in archaeological records, according to the principle of the Middle Range Theory which was proposed by Binford (1981, pp.21-30). In the case of the use-wear analysis, experimental replication plays an important role for bridging arguments between wear patterns and human activities, in other words, between the statics and the dynamics. It is essentially important to construct extensive databases of experimental use-wear formation for the purpose of reliable interpretation of archaeological patterns.

The present paper introduces essential criteria of micro-wear interpretation accumulated by TUMRT (that is, Tohoku University Microwear Research Team) since 1976. The team was initiated by the late Prof. Chosuke Serizawa and has been active up to the present (for its history, e.g., Akoshima 2008). This is to be the first of a series of presentations resulting from the TUMRT inferential criteria. We need to apologize for not having presented our inferential standards due to various circumstances since 1983, although we were repeatedly requested to publish openly our criteria for functional interpretation especially by use-wear analysts nationwide. The data presented here is a portion of microflaking (or micro-scale chipping) replication. Although the inferential method of microflaking was published in a summary fashion (e.g., Akoshima 1987 in English, after Akoshima 1981 in Japanese), and a number of actual analysis of excavated artifacts have been conducted widely in Japan, basic database for interpretation has yet to be fully presented. We hope the microphotographs presented in the article will assume a role of standard use-wear chart for functional studies in prehistory.

EXPERIMENTS AND RESULTS

The database presented here is a part of the first series

of TUMRT project directed by Serizawa until his retirement from Tohoku University in 1983. Experiments were conducted mainly by Akoshima and Kajiware using raw materials of Shale, Chert, and Obsidian. Microflaking data were analyzed by Akoshima (Akoshima 1981, 1989) and the data have been utilized by TUMRT members since then. Microphotographs were printed and served on file at the Department of Archaeology, Faculty of Arts and Letters.

For the present publication, the paper photo-micrographs were scanned (at 600 dpi) and colour digitized for adjusting gray tones, and representative images were selected for presentation of “typical microflaking patterns” which were numerically described in statistical graphs in Akoshima (1987). The pictures here are, in other words, the photographic version of inferential criteria. They are shown as Figure 1 to Figure 28. They are arranged in the order from working soft materials (meat, rawhide, leather, soft plant) to medium (wood, bamboo), to hard materials (bone, antler). Within the category of similar hardness, they are sub-divided and arranged by the method of use, from parallel motions (cutting, sawing) to perpendicular motions (scraping, whittling).

The raw materials presented here are the shale. The shale in the Japanese terminology of lithic analysis denotes a type of fine grained sedimentary rock with breaking feature of conchoidal fracture (no laminar breakage feature). They somewhat look like European flint or American chert, but they are of different rock type. The shale was in wide use throughout prehistory in northeastern part of the Honshu Island of Japan. Out of about 160 experimental artifacts, 80 specimens were selected for the photo presentation. They are flake tools which were utilized without secondary retouch along the edge. Thus, the micro-sized scars seen on these photos are all produced by utilization only.

The order of arranging these microphotographs are as follows. Basically, they are arranged so that the general patterns of groups of microflaking scars are recognized according to the numerical presentation as in Akoshima (1987). The Figures are captioned with the category of worked materials and working edge motions. From Figure 1, they are shown in the following order:

1. Meat, 1.1 cattle (beef), 1.2 pig (pork), 1.3 lamb (mutton), 1.4 duck, 1.5 chicken
2. Plant, 2.1 grass, 2.2 wheat crop, 2.3 rice crop, 2.4 reed, 2.5 pampas grass
3. Hide, 3.1 rawhide, 3.2 half dried hide, 3.3 dry hide
4. Wood, 4.1 paulownia, 4.2 cedar, 4.3 pine, 4.4 alder, 4.5 zelkova, 4.6 others
5. Bamboo
6. Gourd
7. Shell
8. Bone, 8.1 raw, fresh, 8.2 wet and boiled, 8.3 boiled
9. Antler, 9.1 soaked, 9.2 dry, 9.3 others

For the third digit of each photo caption number, the type of motion in use is indicated as follows.

Longitudinal, -1 cutting, -2 sawing

Transversal, -3 whittling, -4 scraping

Varied, -5 chopping, -6 butchering

Incising, -7 graving

Microphotographs were taken using a macro-photo equipment of Olympus OM-2 camera system. The magnification shown in the caption is at the time of photography. Actual scale bar is shown in each photo image.

In the photo caption, "d" means the dorsal surface, while "v" means the ventral surface of the working edge.

For the analysis of resultant microflaking scars, a variety of attributes were recorded and classified. A total of 3840 flaking scars were counted one by one and recorded for 72 specimens. They were statistically investigated and summary published in Akoshima (1987). Major attributes of analytical interests are, the shape of microflaking scar, the size of microflaking scar, the initiation of microflaking scar breakage, the termination of microflaking scar breakage, the density of microflaking scar per centimeter, the degree of concentration of scars to one face of the tool, ventral or dorsal.

The summary of conducted experiments is shown in Table 1 to Table 3. Other than the information in the table for each controlled experiment, thirty conditions were recorded on experiment recording sheets which are on file at Tohoku University. They are as follows:

1. Experiment number (SH#)
 2. Worked material
 3. Kind of action (cutting, sawing, whittling, scraping, boring, chopping, grooving, varied -and reason why)
 4. Number of strokes of tool usage
 5. Place of experiment
 6. Date of experiment
 7. Experimenter
- Tool
8. Shape of the tool, (both ventral and dorsal in illustration)
 9. Edge angle of the tool (measured with a protractor)
 10. Working edge (used portions in red lines in the illustration)

11. Secondary retouch (the hammer, stone or antler) (method of retouch, percussion or pressure flaking) (no retouch on edge)

Activity

12. Direction of activity (indicated in illustration, such as M ←)
13. Contact angle 1. (the angle between the edge line and the worked material) (<20 degrees, 30, 45, 60, >80)
14. Contact angle 2. (the angle between the ventral surface and the worked material) (<20 degrees, 30, 45, 60, >80)
15. Method of prehension (bare hand, gloved, hafted -type and method)
16. Which hand was used? (right, left)
17. Duration of experiment (in minutes)
18. Rate of work (number of strokes of tool use, per minute)
19. Approximate length of each stroke, () cm/1 stroke (distance of tool movement)

Worked Material

20. Species name
21. Which part of the worked material was worked? (descriptive)
22. Shape, diameter, thickness, etc. of the worked material (descriptive)
23. Detailed conditions of the worked material, at least indicating, (dry, wet), (fresh, boiled, seasoned, soaked, frozen, tanned)
24. Place of the experimental work (in detail such as laboratory or field conditions)
25. Sand, soil, dirt, etc. involved during experiment
26. Water conditions during experiment
27. What kind of backing was used under the worked material? (cutting board, flat stone, for example)
28. How was the tool during experiment? (sharpness, breakage, utilization retouch, fat, etc., descriptive)
29. Location of the working edge (in 8 division polar coordinate) (1 2 3 4 5 6 7 8)
30. Which surface was in contact with the worked material? (ventral, dorsal)

In the figures and tables, the experiment numbers of KSM# which accompany SH tool numbers mean "the Kusumoto experiment number" (carried out by Mr. Masasuke Kusumoto in Ishinomaki City, Miyagi Prefecture). They were the specimens utilized for the blind test of functional determination by the method of use wear analysis. The blind test results are published in Kajiwarra and Akoshima (1981). However, detailed conditions of the blind test experiments were not disclosed, and some blanks remain in the table.

CONCLUSIONS

The databases presented here are to be utilized as basic reference materials for microflaking interpretation. The microphotographs are provided for various worked materials

from soft to hard, and for various tool use movements from longitudinal to transversal motion. Picture samples are selected here for representative microflaking types and disposition, as were reported in the past publications (Akoshima, 1981, 1987). It is emphasized that the actual appearances of microflaking scars show a wide range of variability, in cases where the tools were put to the same kind of use. The variability of scars is recognized even along the same edge of a particular experimental artifact. Akoshima (1989) adopted a statistical approach to reduce such points of weakness. The variability in actual appearances of the groups of microflaking scars will be presented in our next article to be continued. We wish the phenomenon of micro-scale chipping on the edge of lithic artifacts will be evaluated as important clues to the study of human cultural adaptations. Microflaking has been considered as a major criterion for functional interpretation since the inception of experimental research (e.g., Tringham, et al. 1974) in American archaeology (e.g., Odell 1996), and in Asian countries (e.g., Gao and Chen eds. 2008). We sincerely hope that also in Japan, this category of use-wear will play an important role as integrated with other categories of wears such as microwear polishes and striations.

ACKNOWLEDGEMENT

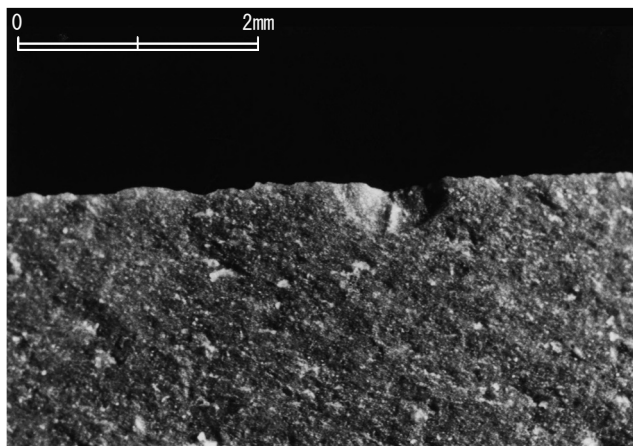
Prof. Hiroshi Kajiwarara of Tohoku Fukushi University conducted many of the replicative experiments together with the first author while he was at Tohoku University. We are grateful to Prof. Toshio Yanagida of the Tohoku University Museum for providing publication pages in its Bulletin series. The database building of this sort sometimes faces difficulties to find necessary places to be accommodated in terms of the volume. We sincerely hope that in the future

Bulletin series, essential parts of TUMRT research standards may find their places. Additionally, the Bulletin series are available for download through the Internet (may be referred to the Tohoku University Museum for current situations).

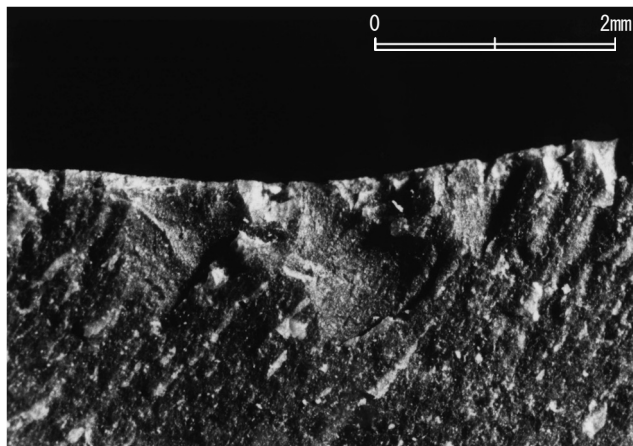
This article is a result of KAKENHI (2013, number 25370885), granted to Akoshima.

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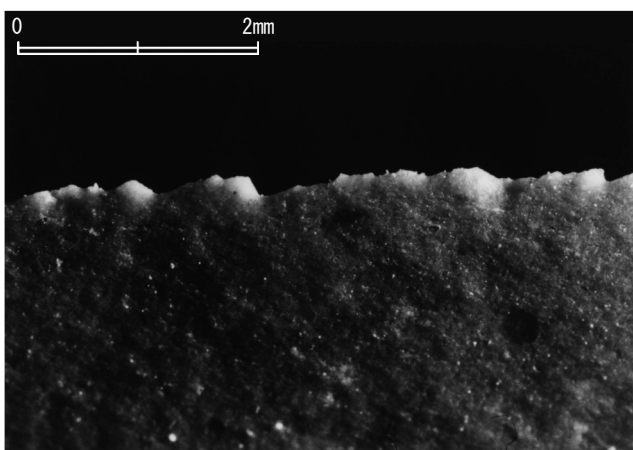
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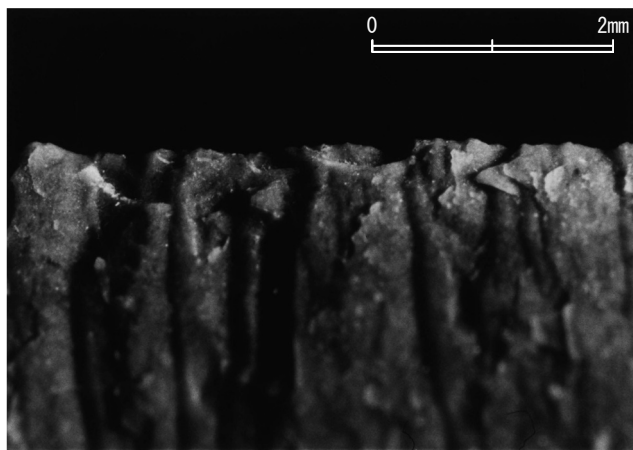
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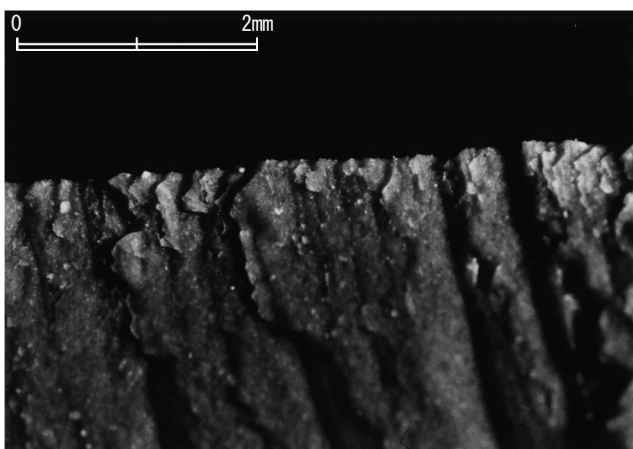
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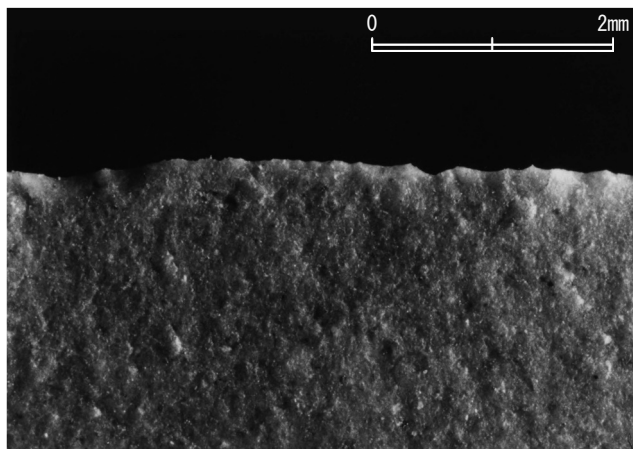
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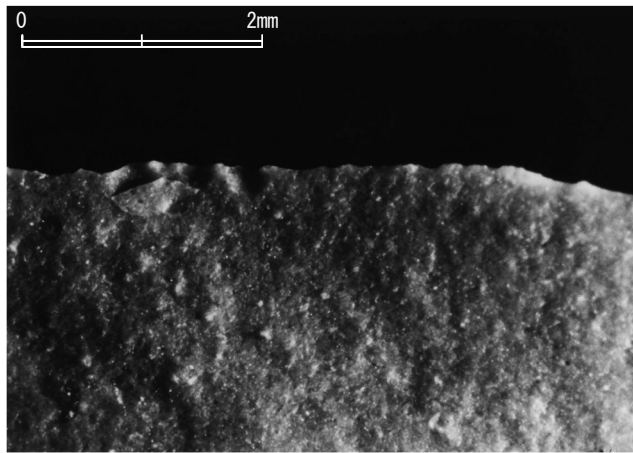


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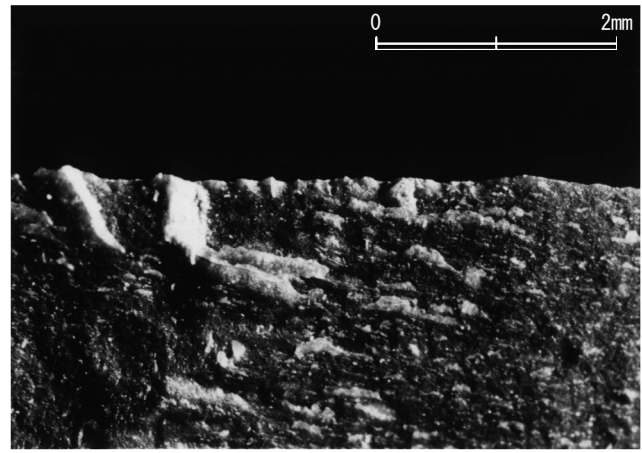


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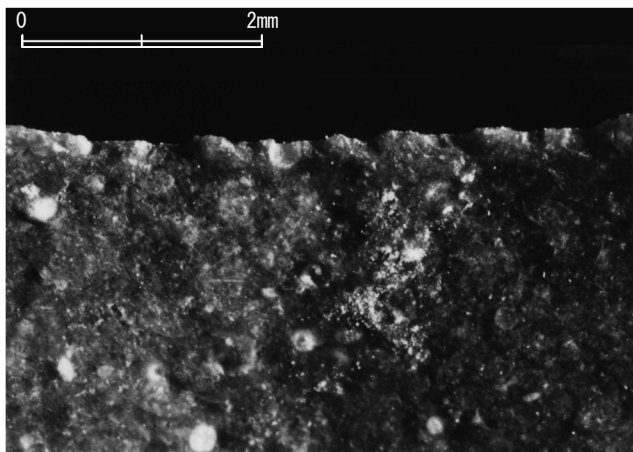
Figure 1. Experimental microflaking scars. (soft worked materials)



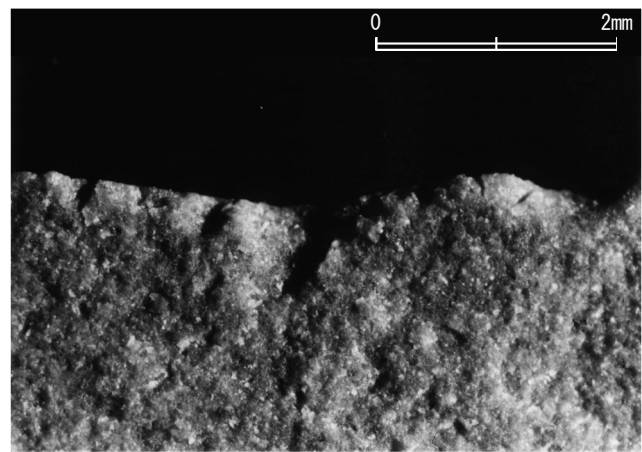
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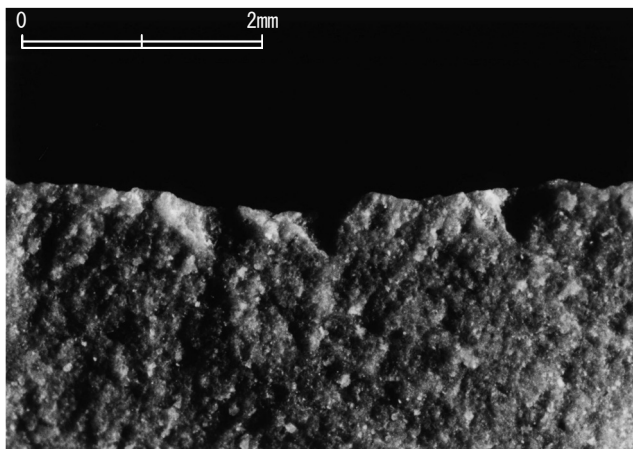
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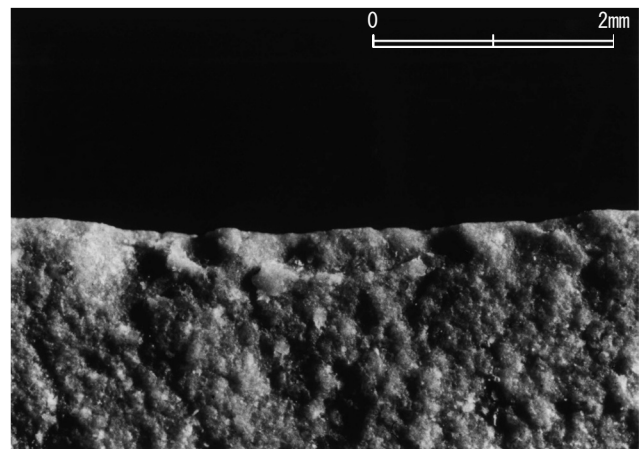
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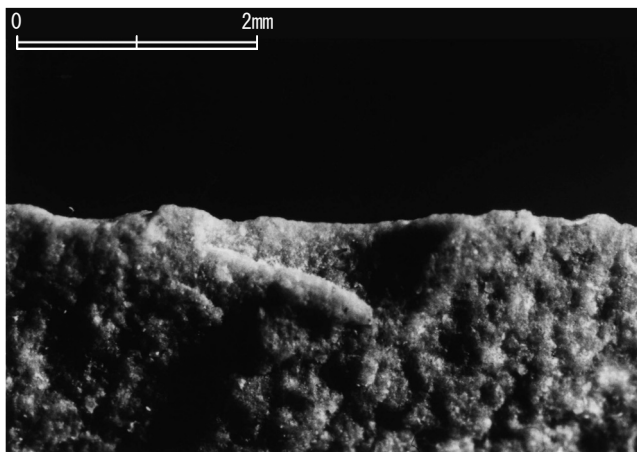


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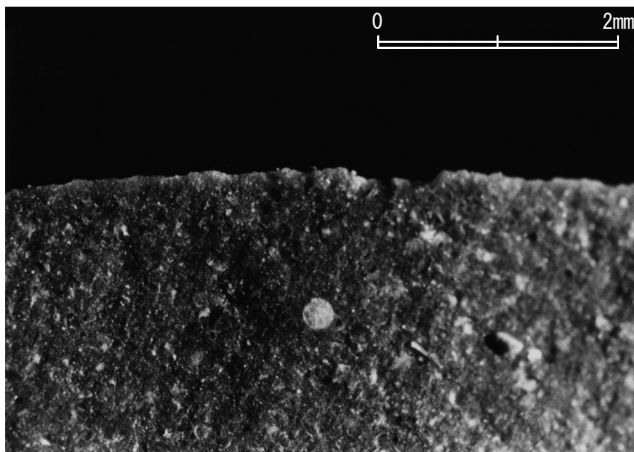


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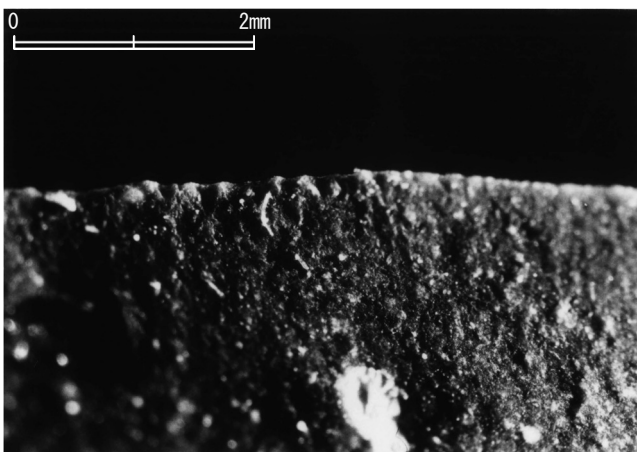
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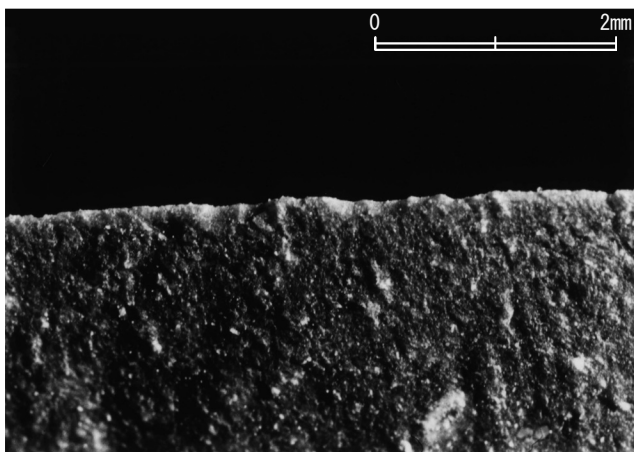
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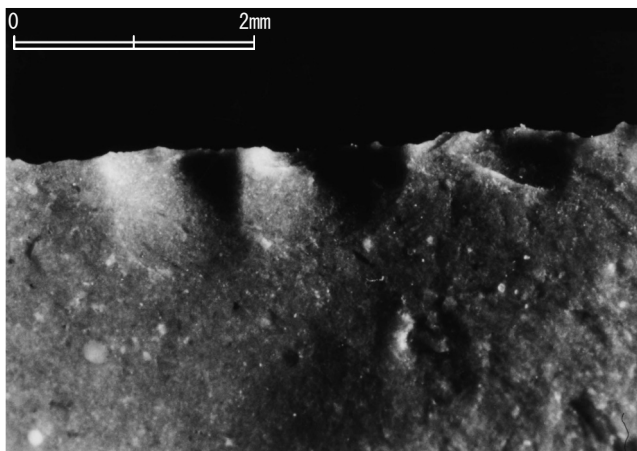
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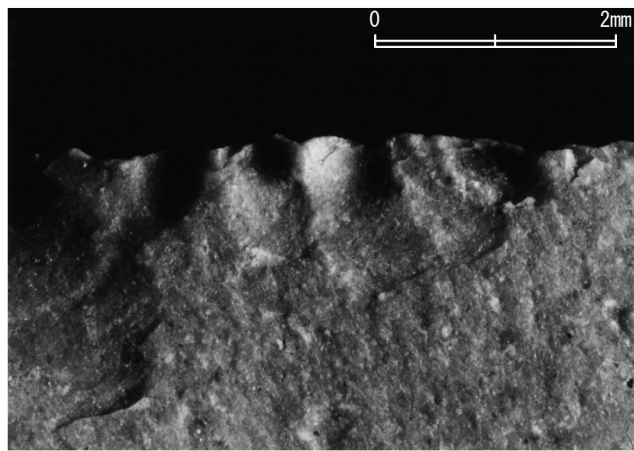
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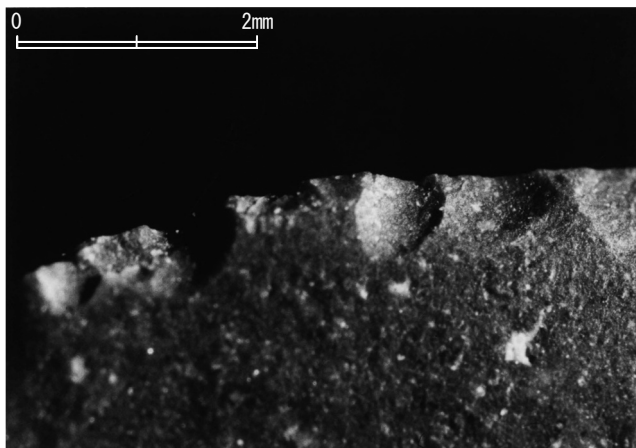


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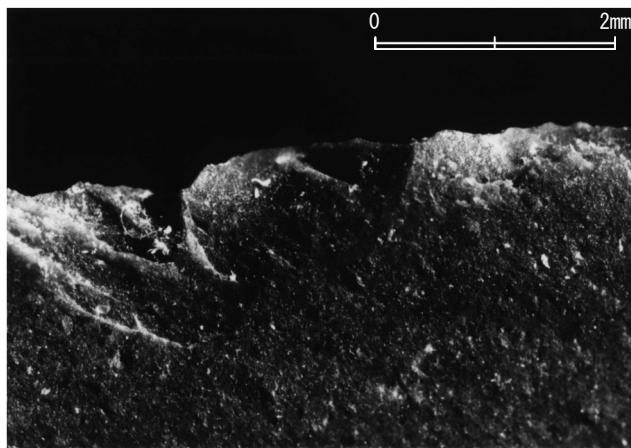


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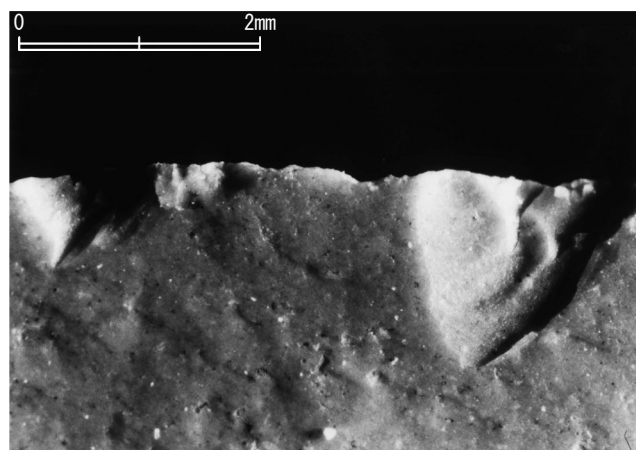
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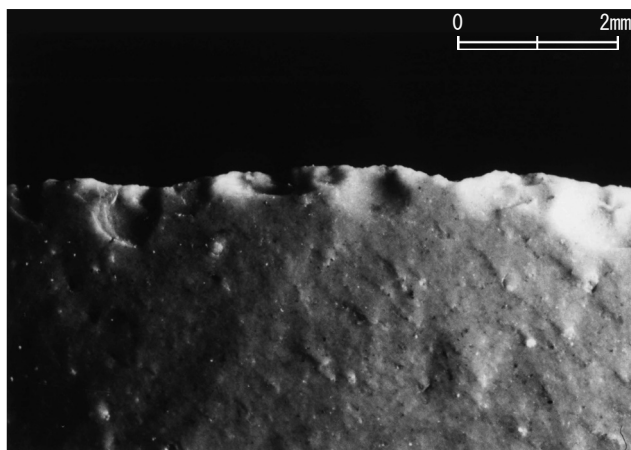
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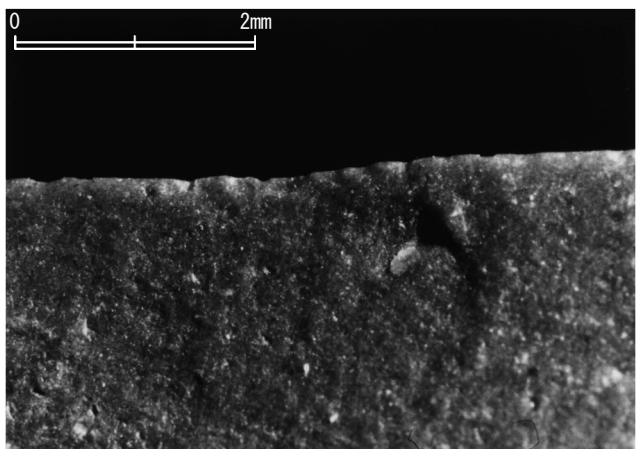
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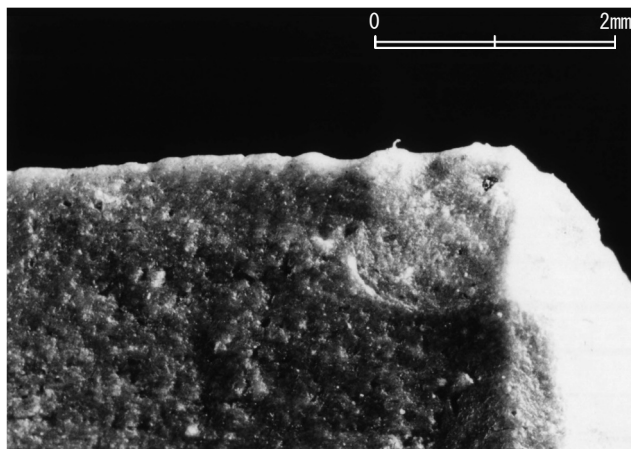
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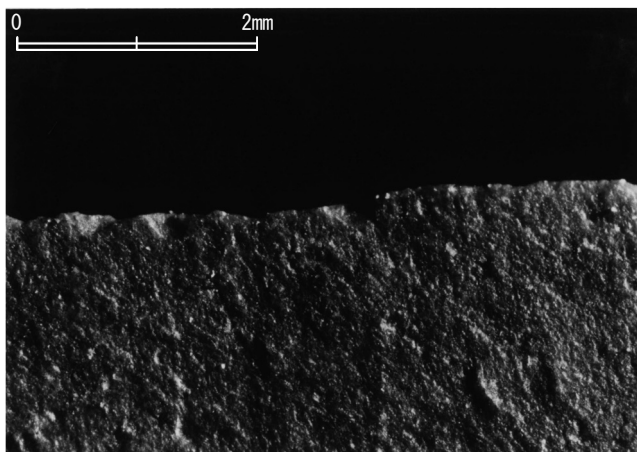


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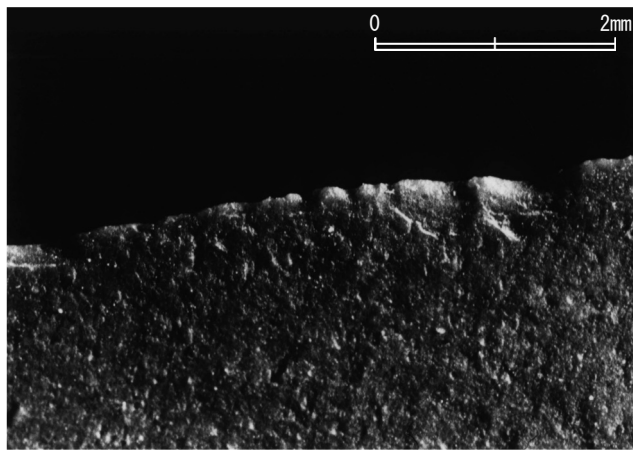


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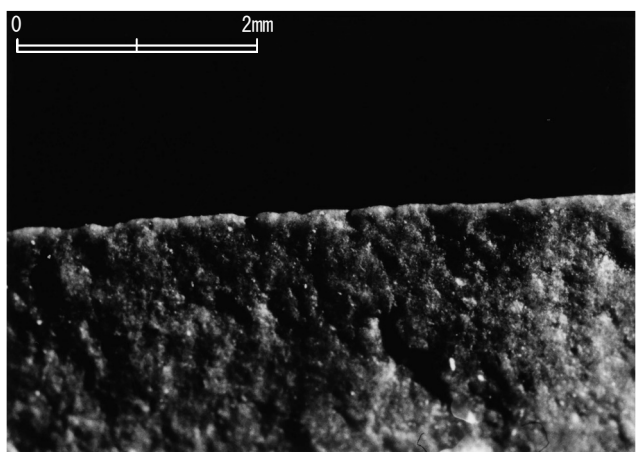
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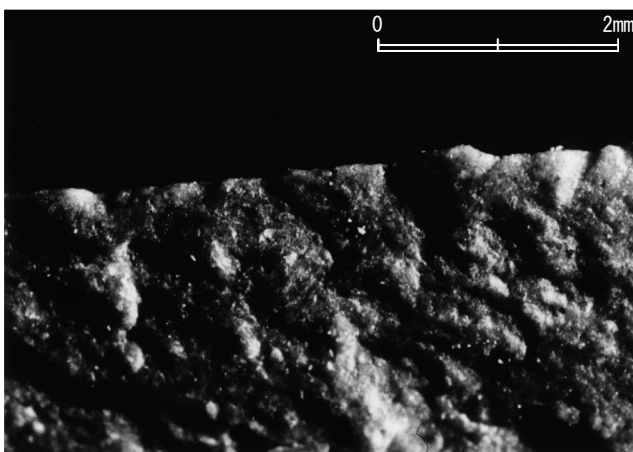
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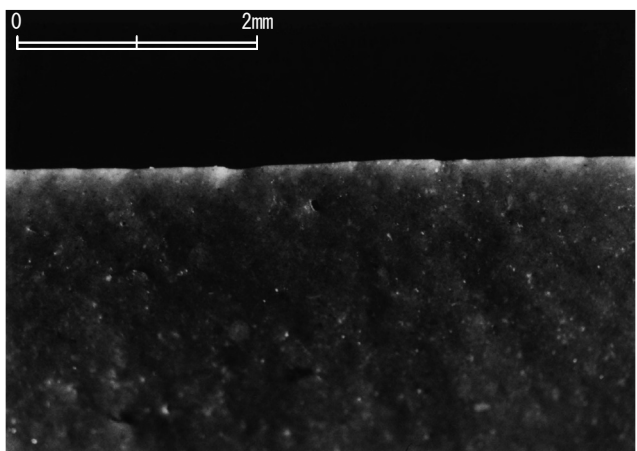
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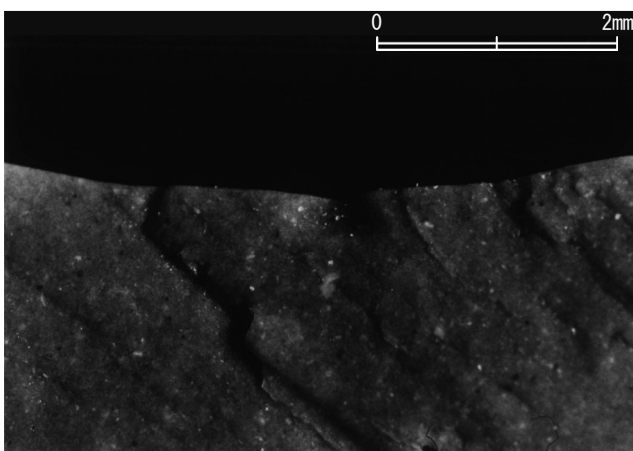
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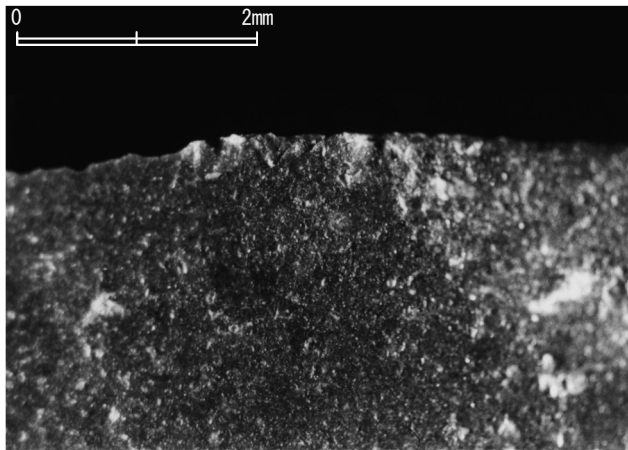


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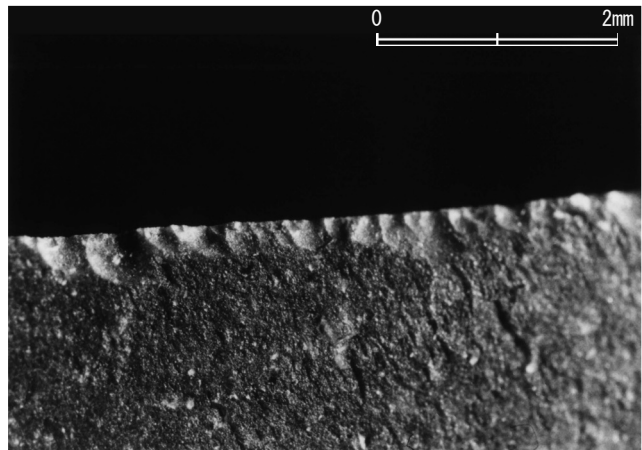


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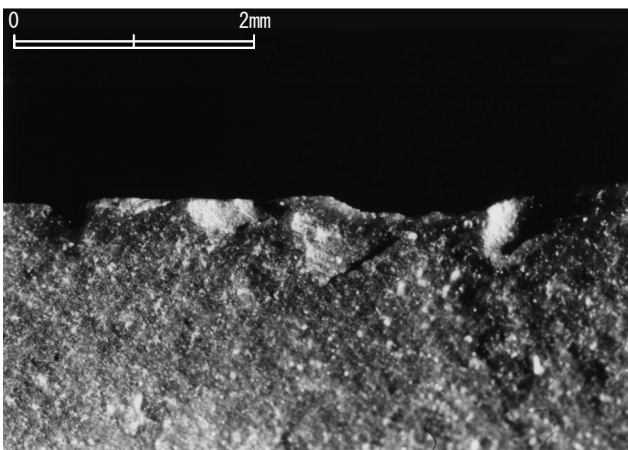
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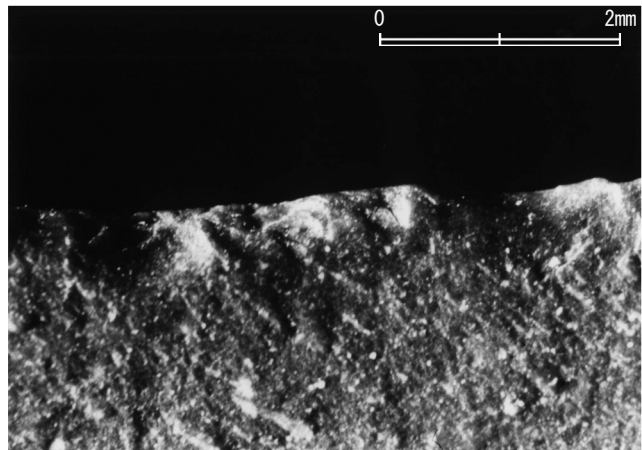
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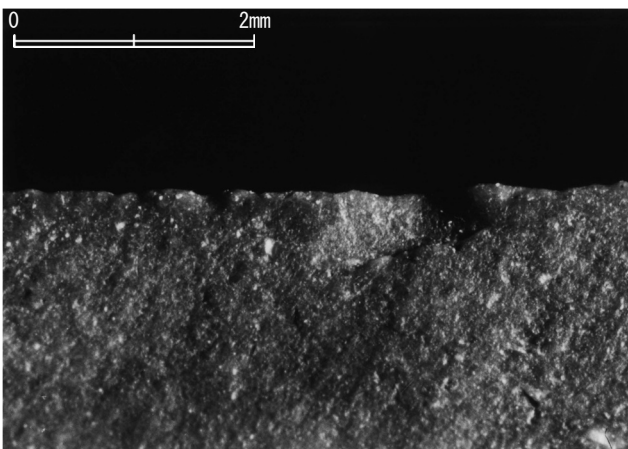
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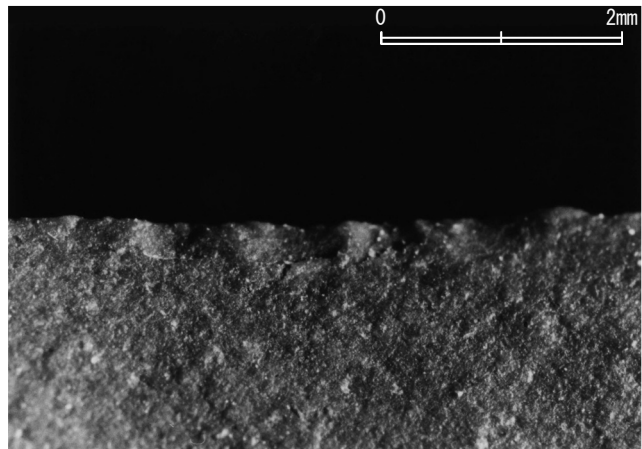
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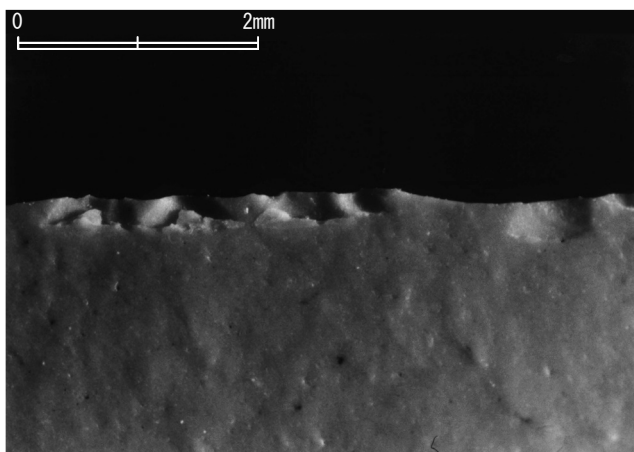


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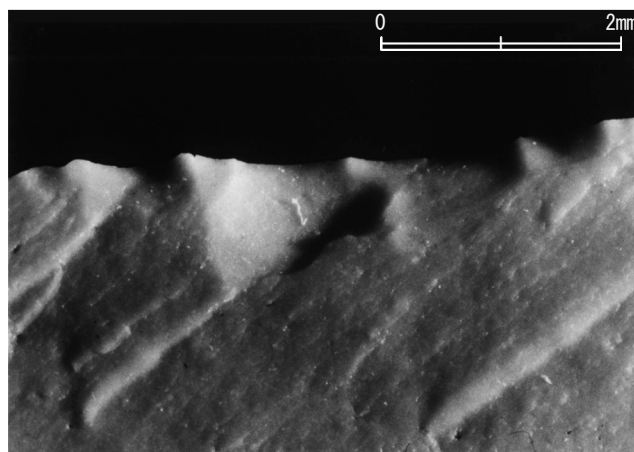


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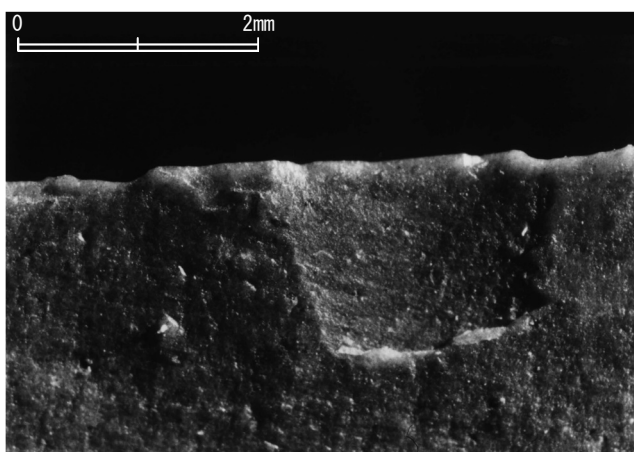
Figure 6. Experimental microflaking scars. (soft worked materials)



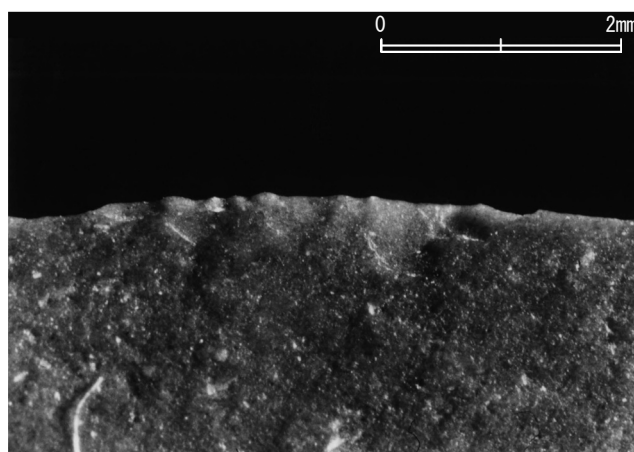
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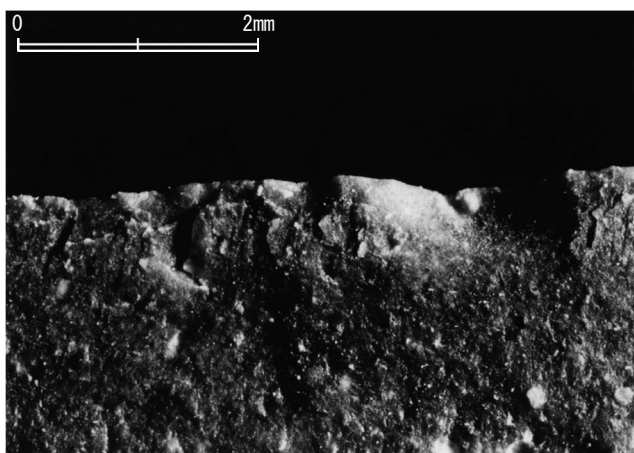
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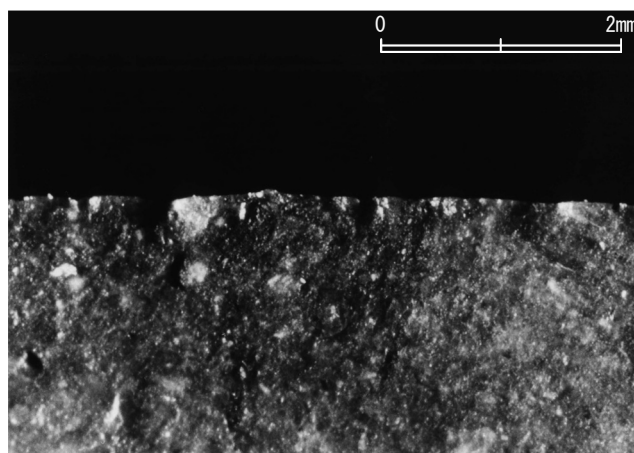
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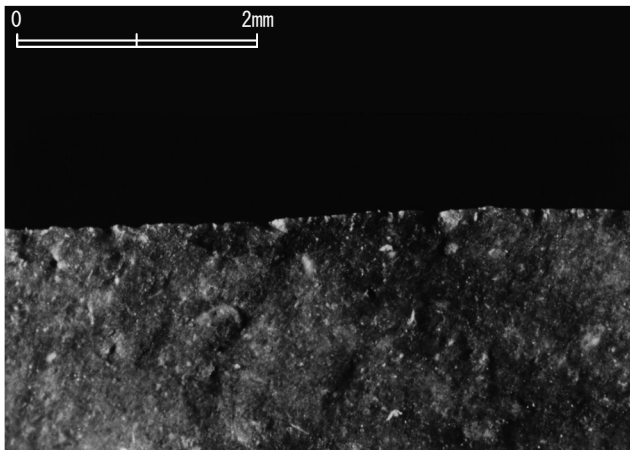


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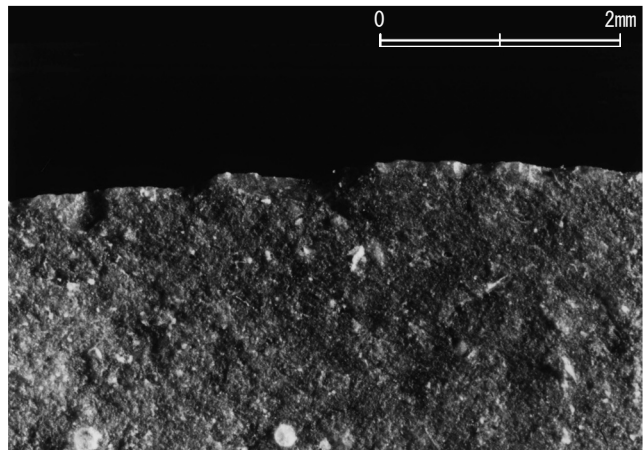


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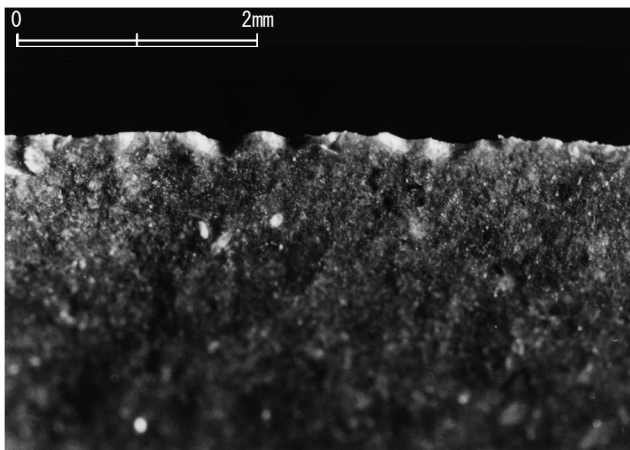
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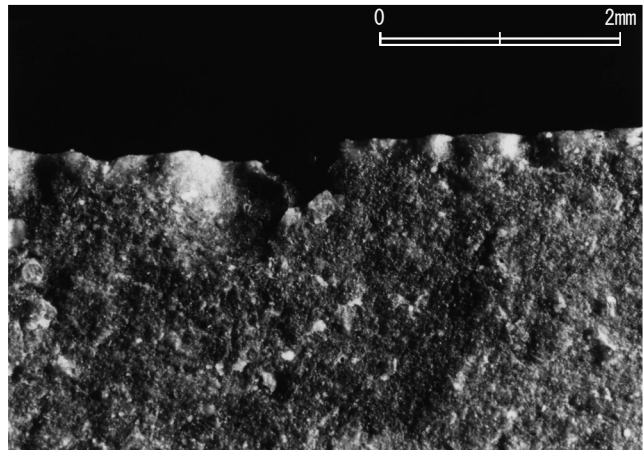
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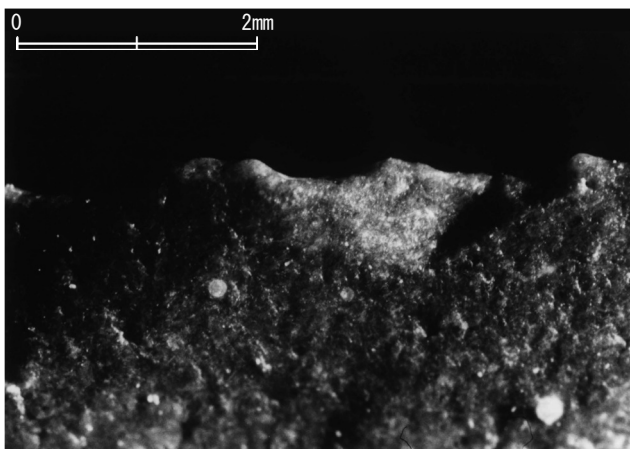
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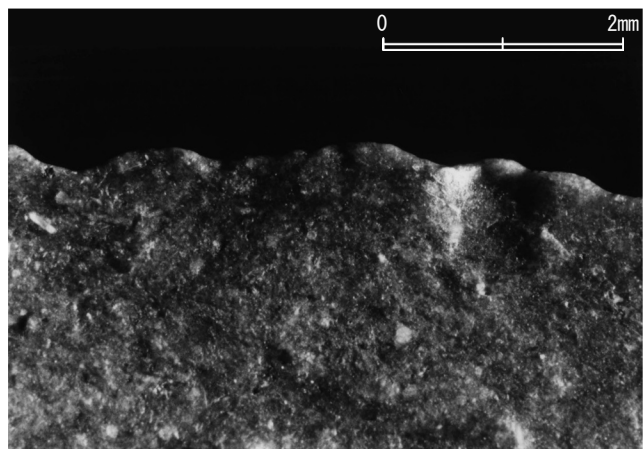
(3) 3.1-4. hide scrape 2200st (SH122v) 8x



(4) 3.1-4. hide scrape 2000st (SH123d) 8x

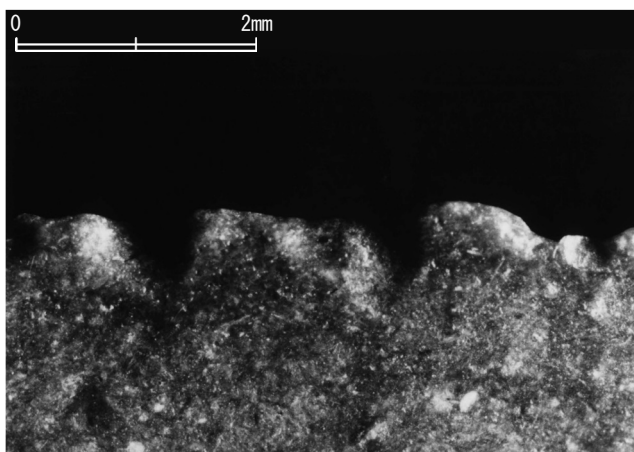


(5) 3.1-4. hide scrape 2000st (SH123v) 8x

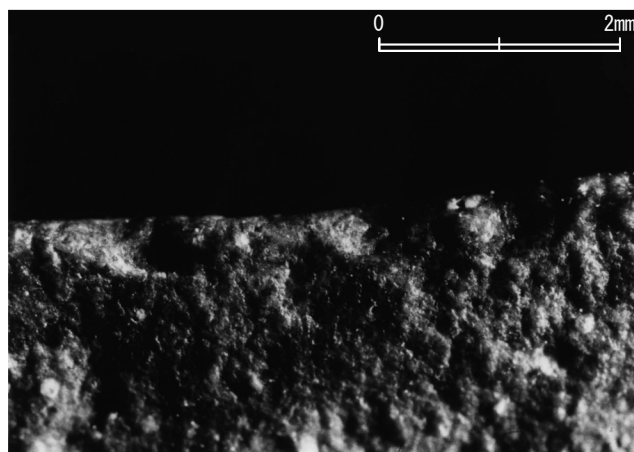


(6) 3.1-4. hide scrape 800st (SH124d) 8x

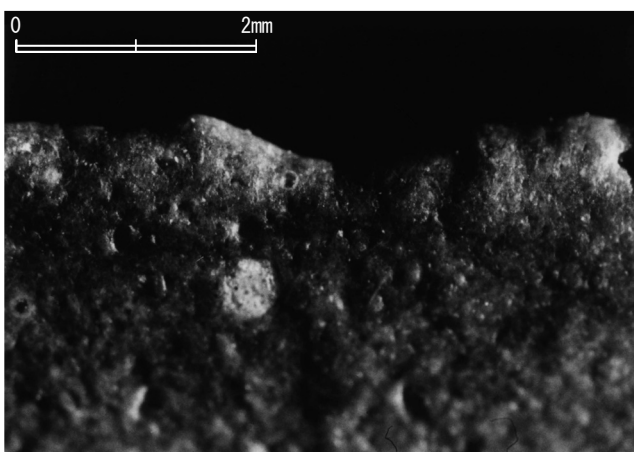
Figure 8. Experimental microflaking scars. (soft worked materials)



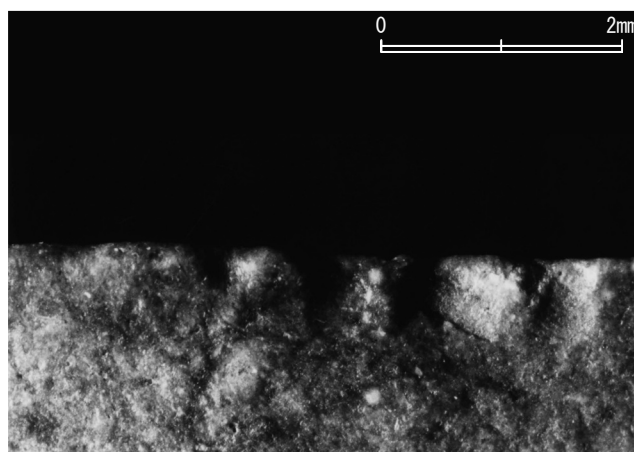
(1) 3.1-4. hide scrape 800st (SH124v) 8x



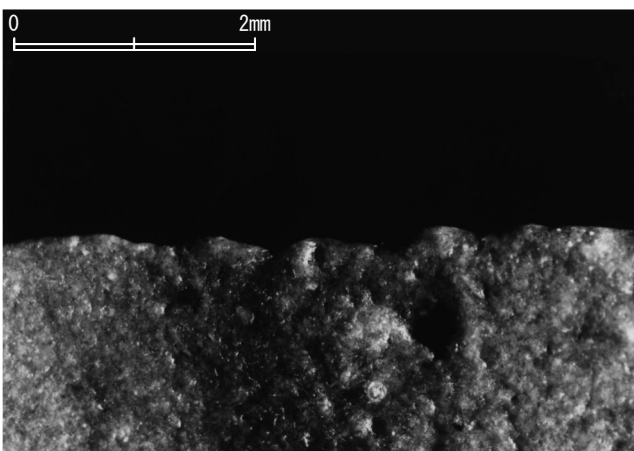
(2) 3.1-4. hide scrape 2000st (SH125) 8x



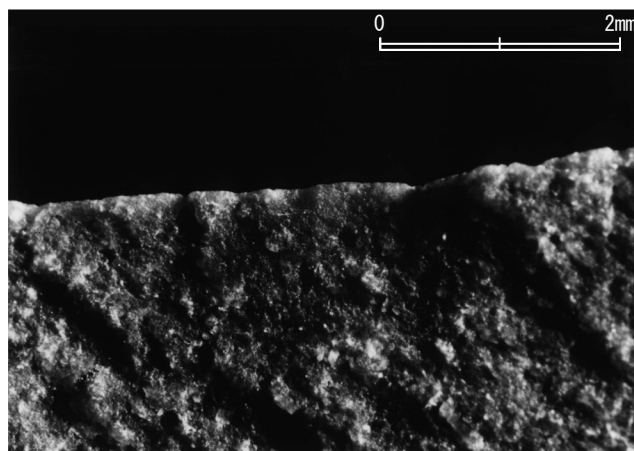
(3) 3.1-4. hide scrape 2000st (SH125) 8x



(4) 3.1-4. hide scrape 2000st (SH126d) 8x

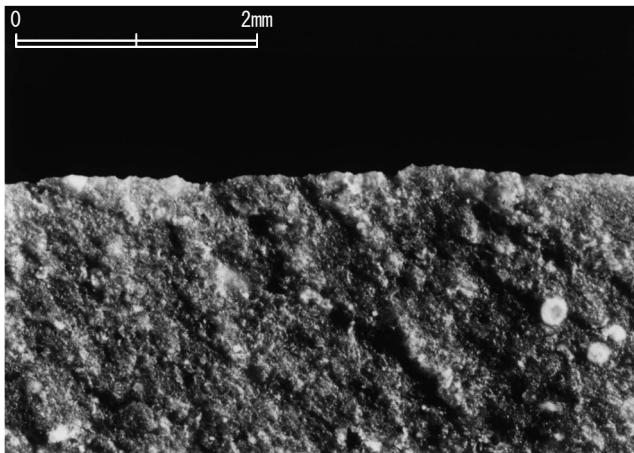


(5) 3.1-4. hide scrape 2000st (SH126v) 8x

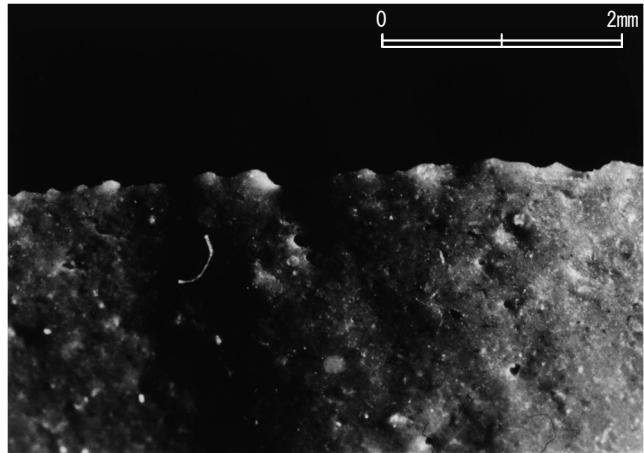


(6) 3.2-4. hide scrape 2000st (SH128d) 8x

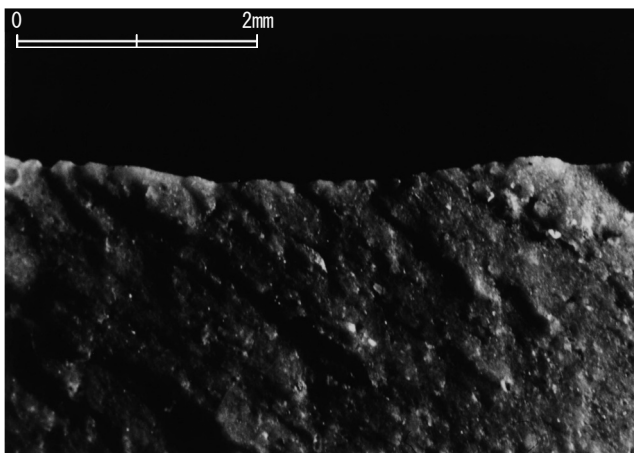
Figure 9. Experimental microflaking scars. (soft worked materials)



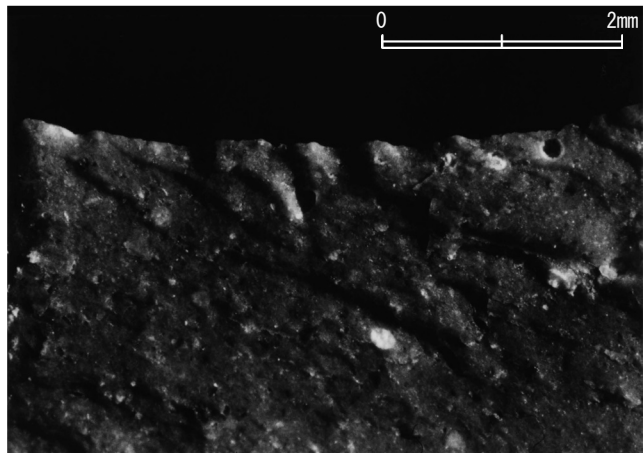
(1) 3.2-4. hide scrape 2000st (SH128v) 8x



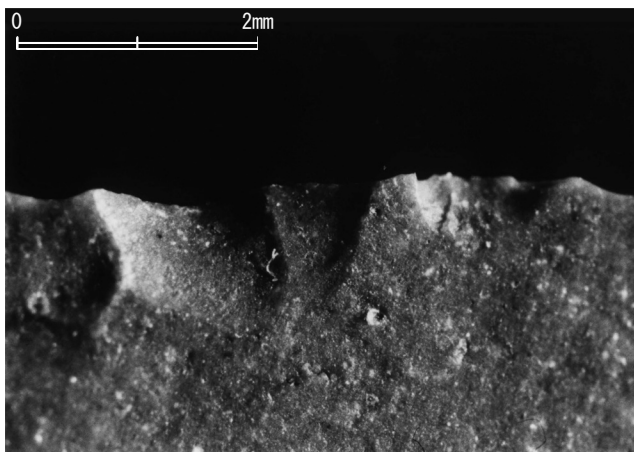
(2) 3.2-4. hide scrape 4000st (SH129d) 8x



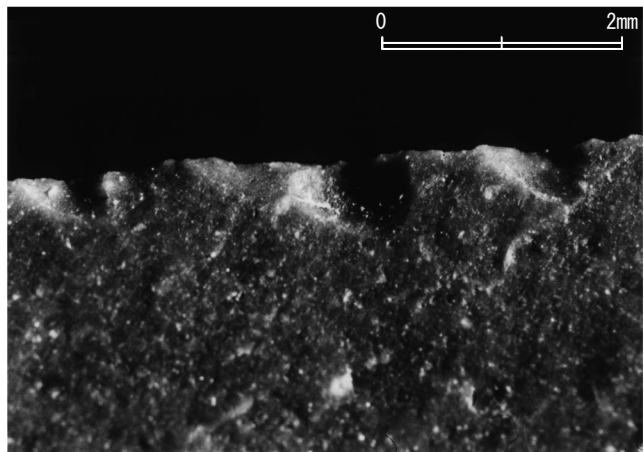
(3) 3.2-4. hide scrape 4000st (SH129v) 8x



(4) 3.2-4. hide scrape 4000st (SH129v) 8x

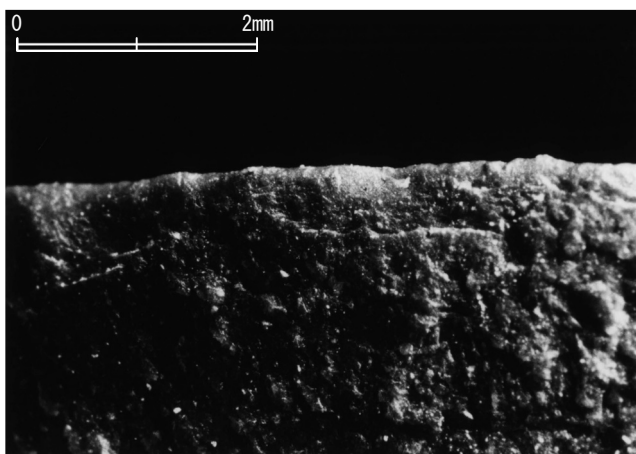


(5) 3.3-2. hide saw 5000st (SH76d) 8x

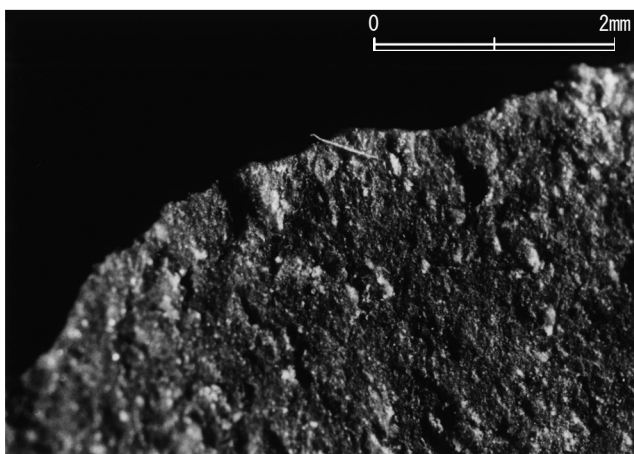


(6) 3.3-2. hide saw 5000st (SH76v) 8x

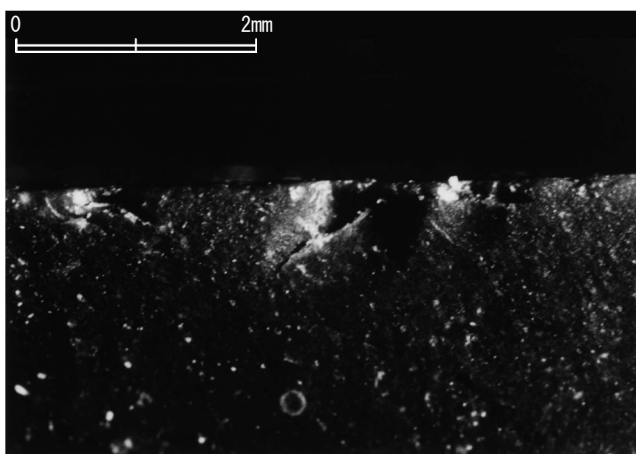
Figure 10. Experimental microflaking scars. (soft worked materials)



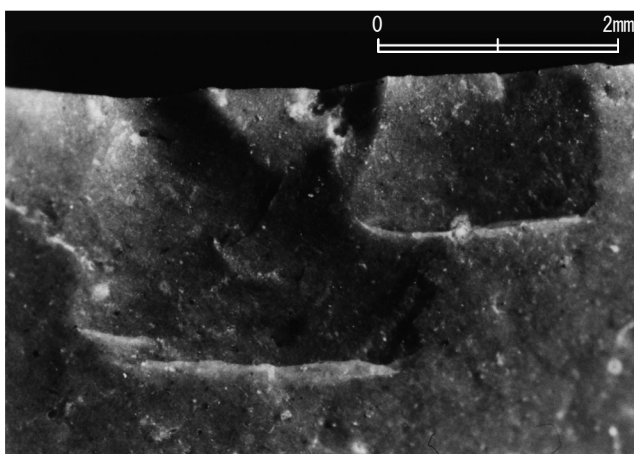
(1) 3.3-4. hide scrape 1500st (SH130) 8x



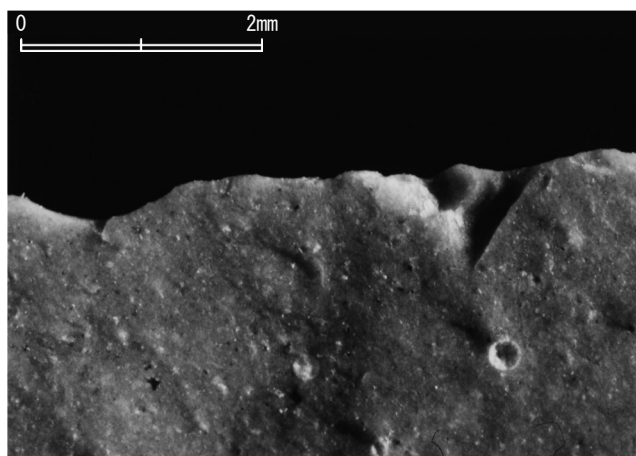
(2) 3.3-4. hide scrape 1500st (SH130) 8x



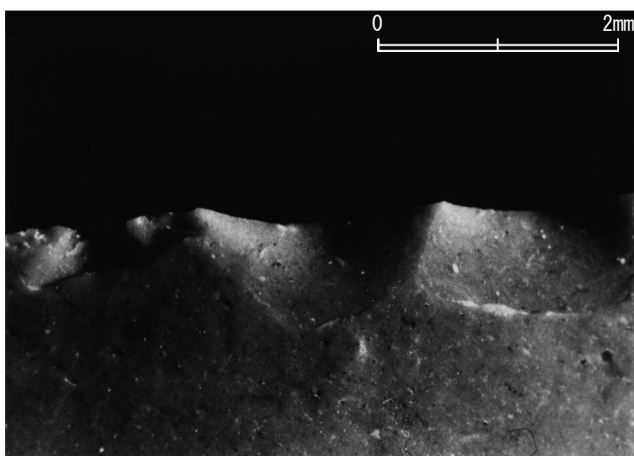
(3) 3.3-4. hide scrape 1500st (SH131) 8x



(4) 3.3-4. hide scrape 1000st (SH146d) 8x

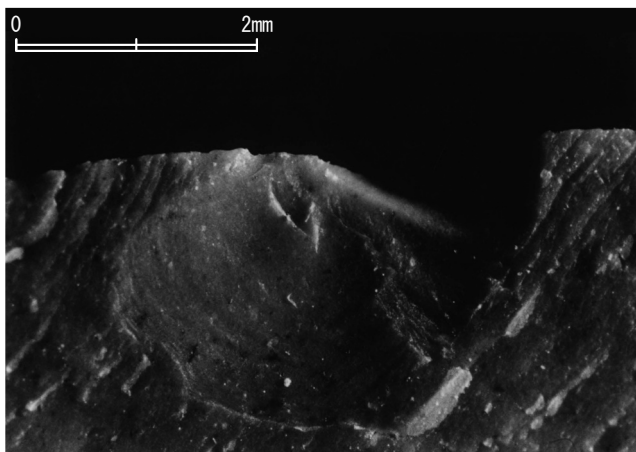


(5) 3.3-4. hide scrape 1000st (SH146v) 8x

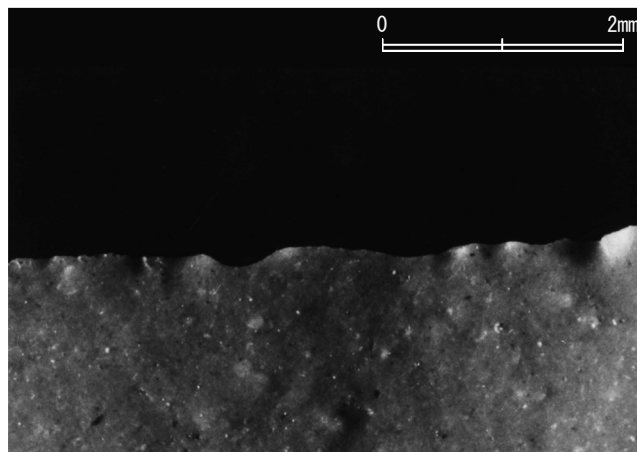


(6) 3.3-5. hide chop 306st (SH148d) 8x

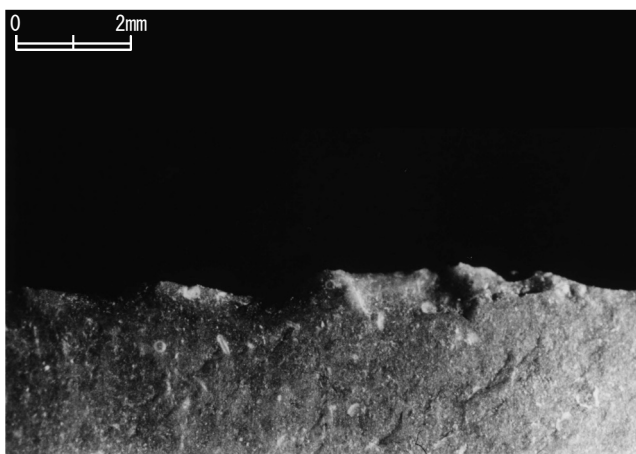
Figure 11. Experimental microflaking scars. (soft worked materials)



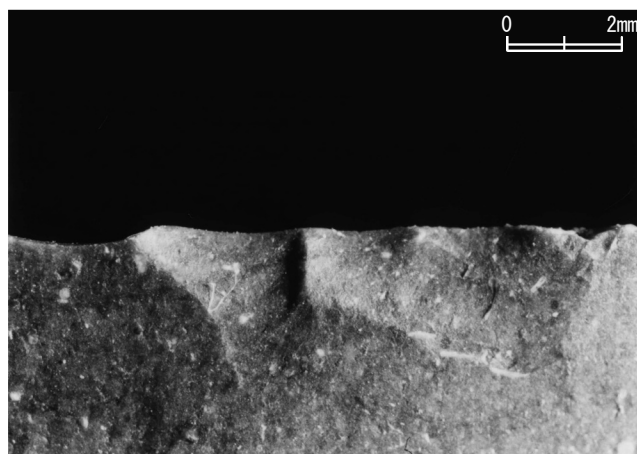
(1) 3.3-5. hide chop 306st (SH148v) 8x



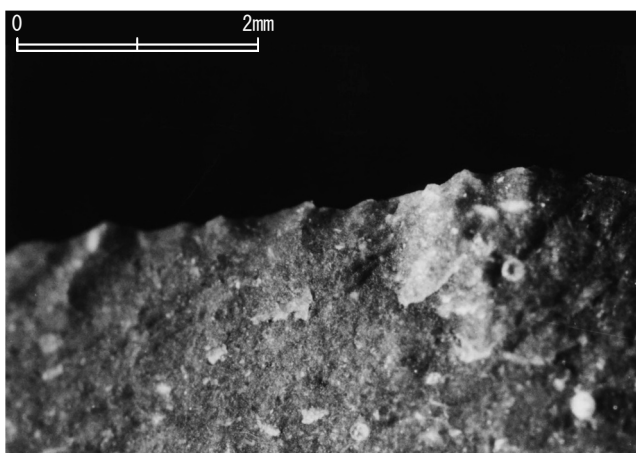
(2) 4.1-1. wood cut (KSM12d) 8x



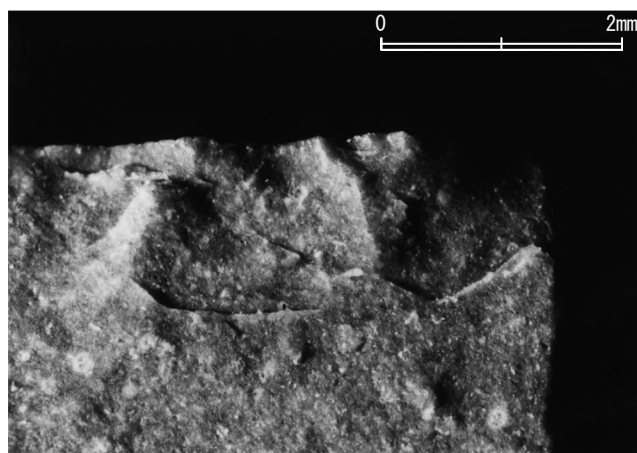
(3) 4.1-2. wood saw 1000st (SH115d) 3x



(4) 4.1-2. wood saw 1000st (SH115v) 3x

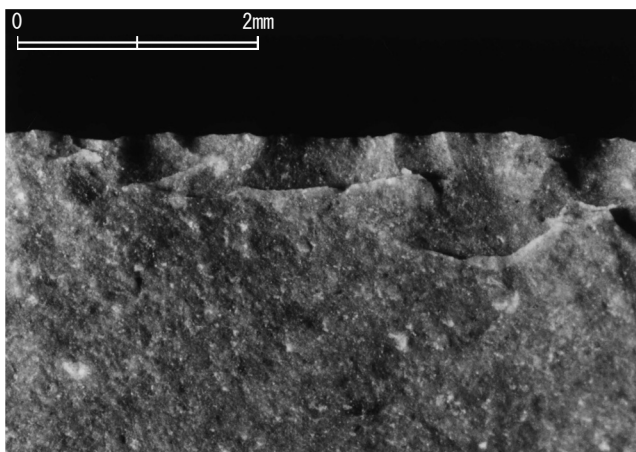


(5) 4.1-3. wood whittle 1000st (SH114v) 8x

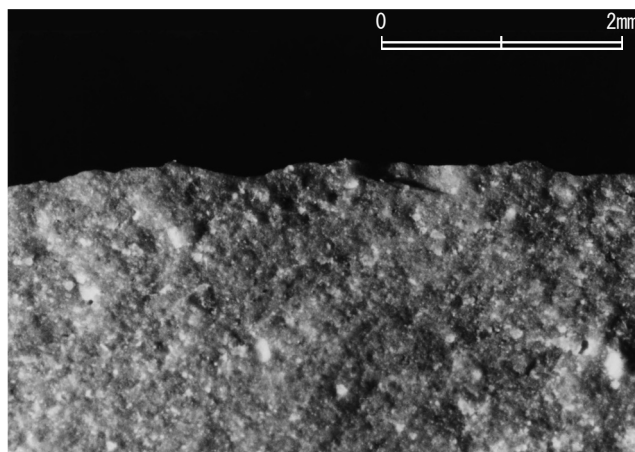


(6) 4.1-4. wood scrape 1000st (SH111d) 8x

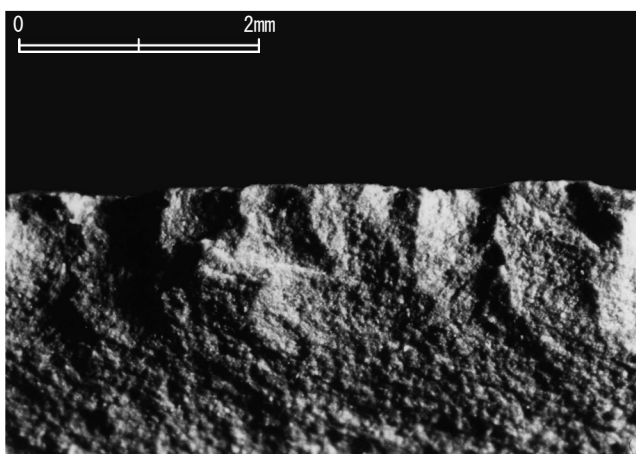
Figure 12. Experimental microflaking scars. (soft to medium worked materials)



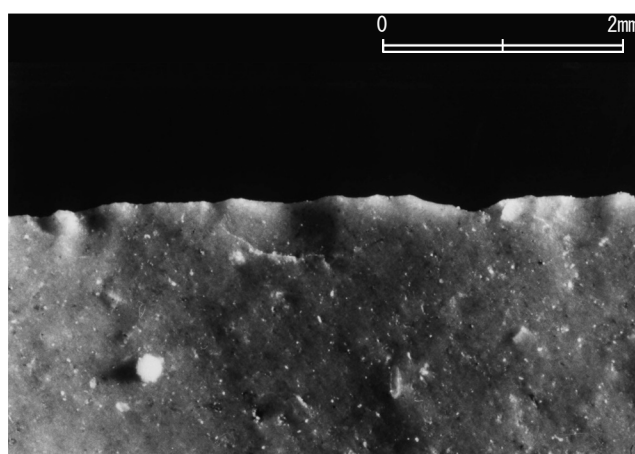
(1) 4.1-4. wood scrape 1000st (SH111d) 8x



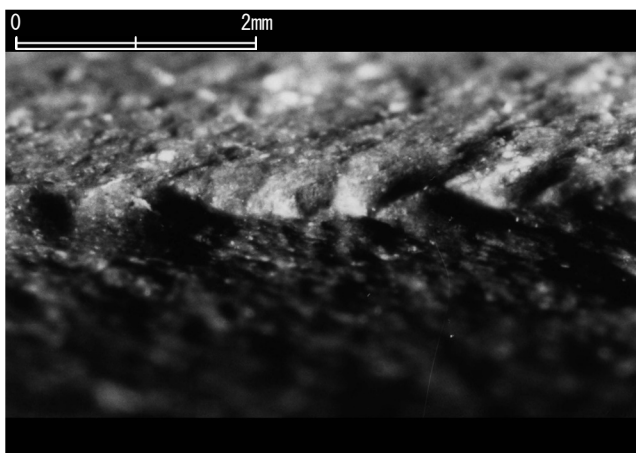
(2) 4.1-4. wood scrape 1000st (SH111v) 8x



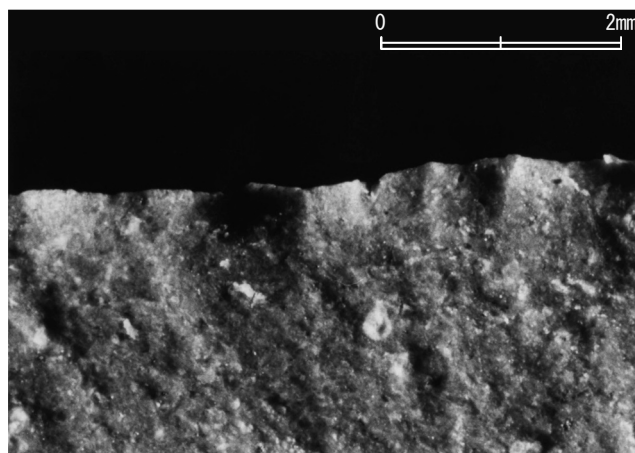
(3) 4.2-3. wood whittle (KSM16Bd) 8x



(4) 4.2-3. wood whittle (KSM20d) 8x

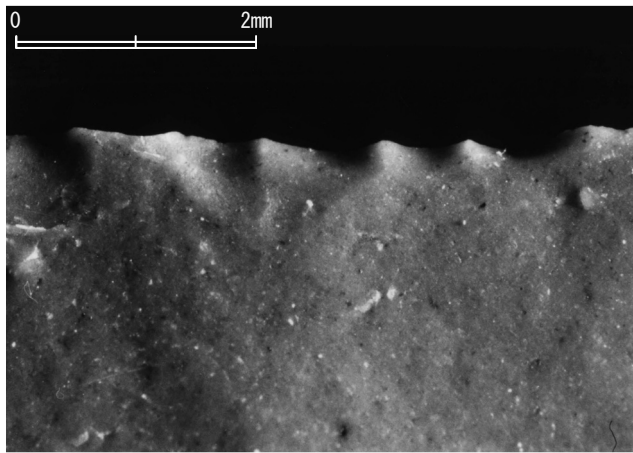


(5) 4.2-3. wood whittle (KSM26) 8x

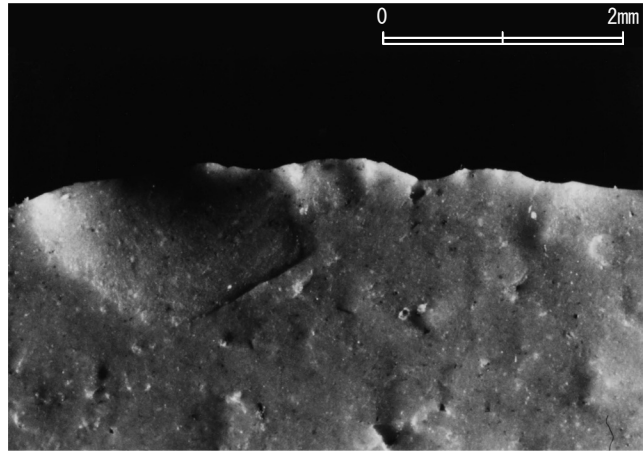


(6) 4.2-3. wood whittle (KSM26v) 8x

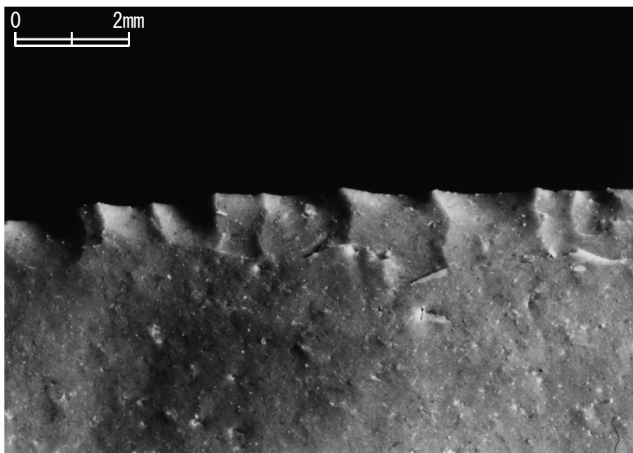
Figure 13. Experimental microflaking scars. (medium worked materials)



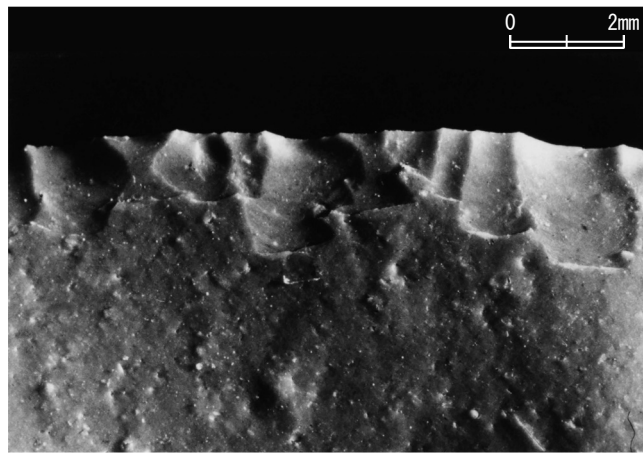
(1) 4.2-3. wood whittle 1000st (SH96d) 8x



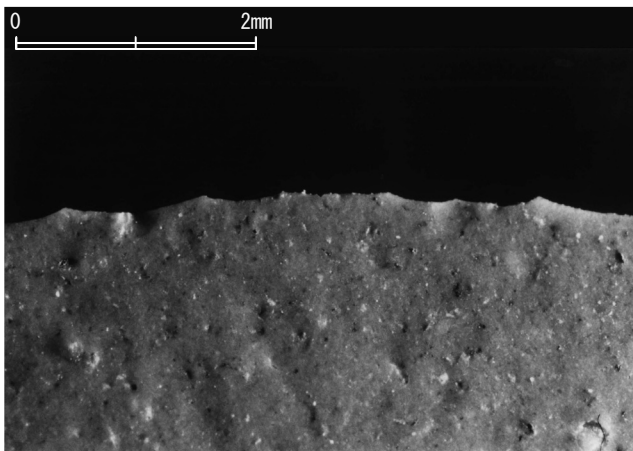
(2) 4.2-3. wood whittle 1000st (SH96v) 8x



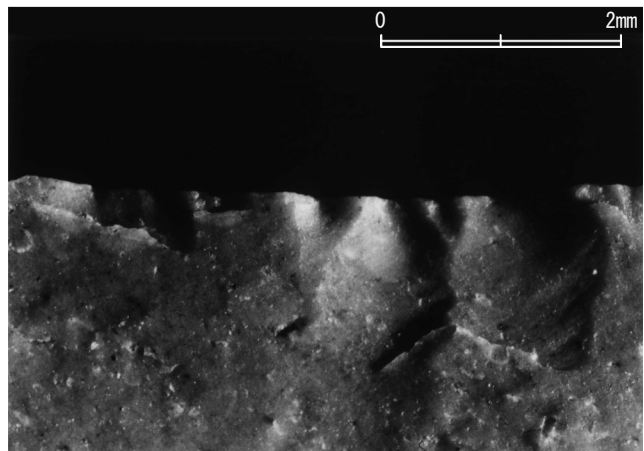
(3) 4.2-4. wood scrape 500st (SH150d) 3.5x



(4) 4.2-4. wood scrape 500st (SH150d) 3.5x

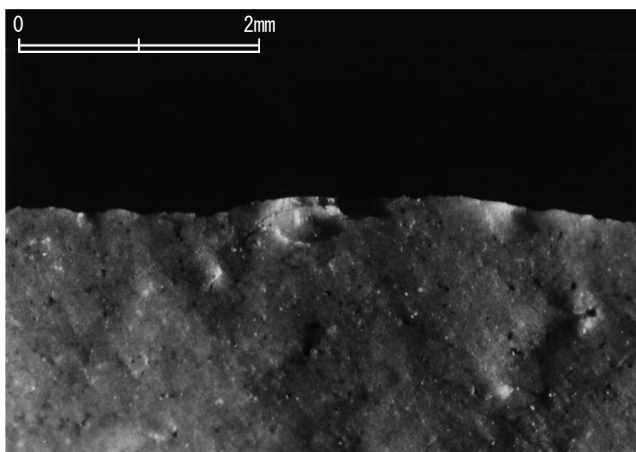


(5) 4.2-4. wood scrape 500st (SH150v) 8x

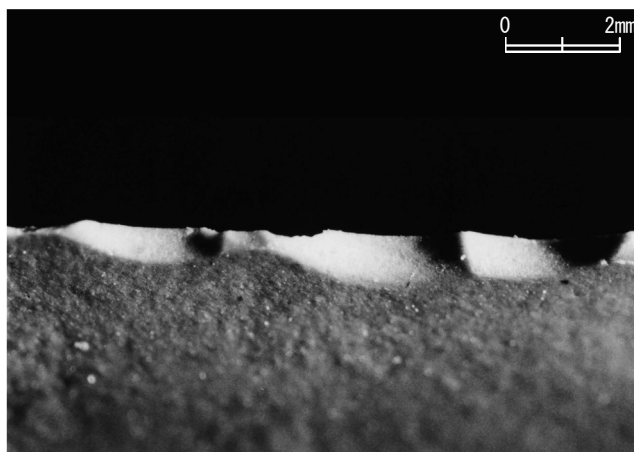


(6) 4.2-4. wood scrape 1000st (SH151d) 8x

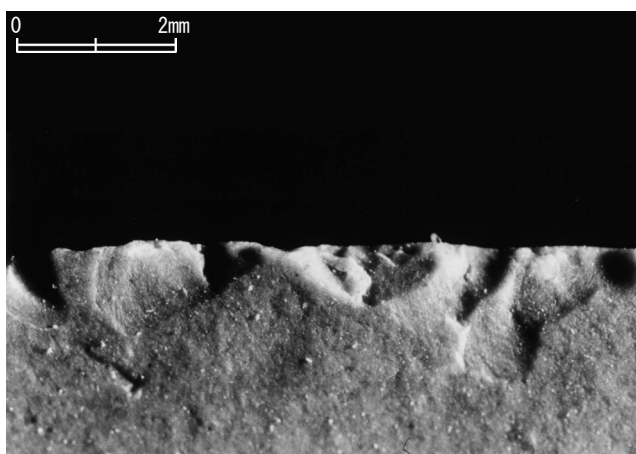
Figure 14. Experimental microflaking scars. (medium worked materials)



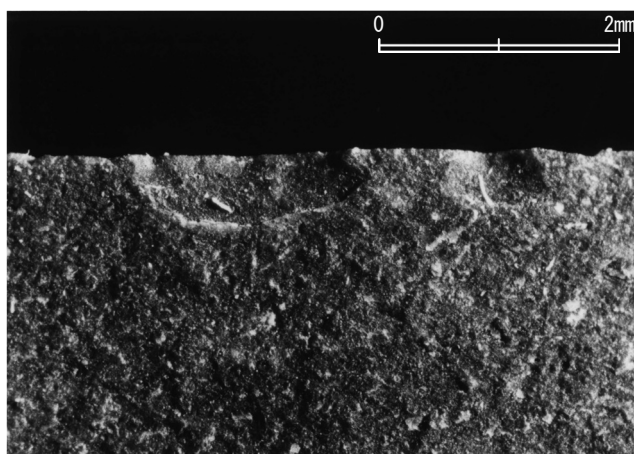
(1) 4.2-4. wood scrape 1000st (SH151v) 8x



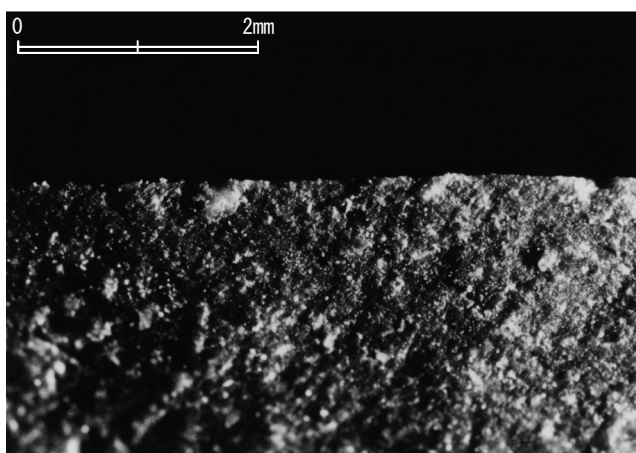
(2) 4.3-2. wood saw 2000st (SH44) 3x



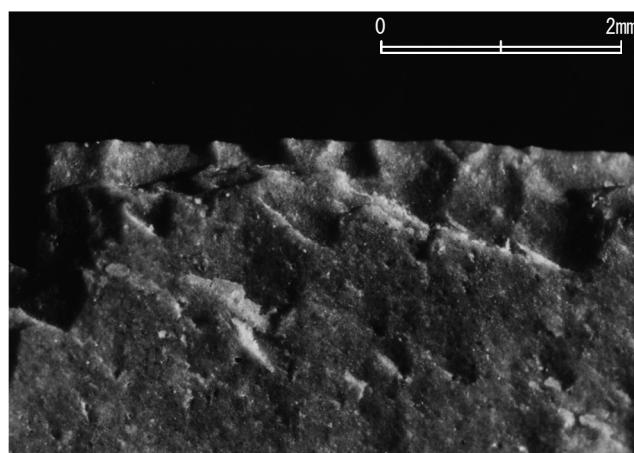
(3) 4.3-2. wood saw 2000st (SH44v) 5x



(4) 4.3-3. wood whittle 1500st (SH46d) 8x

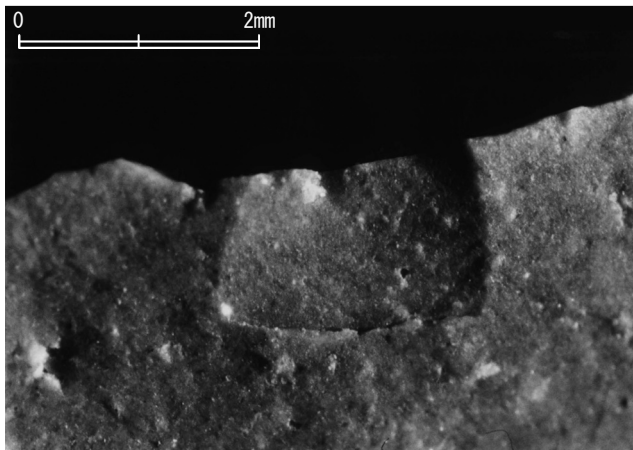


(5) 4.3-3. wood whittle 1500st (SH46v) 8x

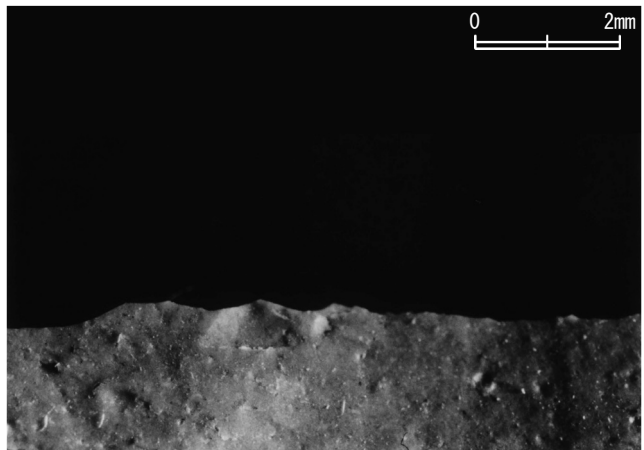


(6) 4.3-3. wood whittle 2000st (SH100d) 8x

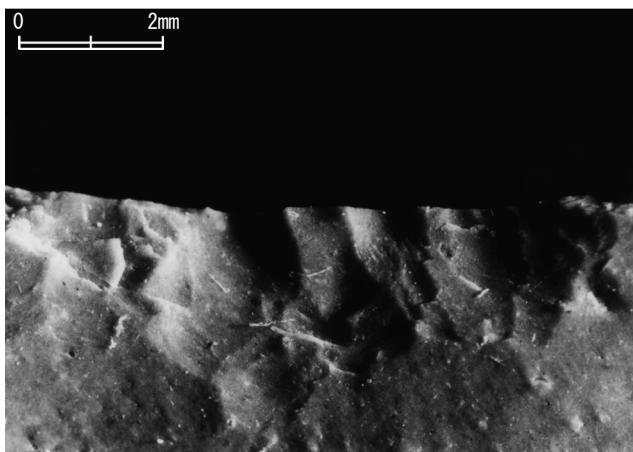
Figure 15. Experimental microflaking scars. (medium worked materials)



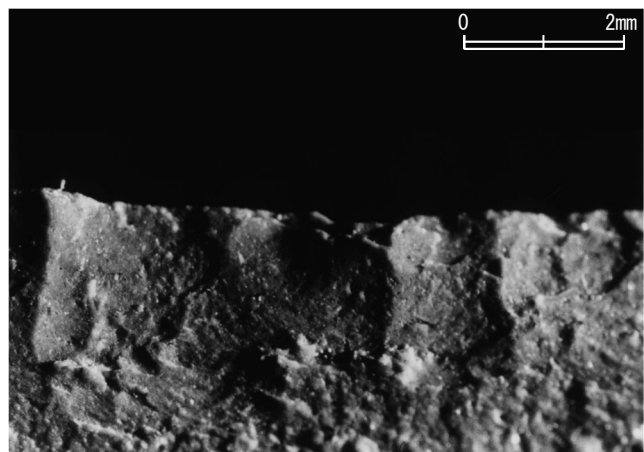
(1) 4.3-3. wood whittle 2000st (SH100v) 8x



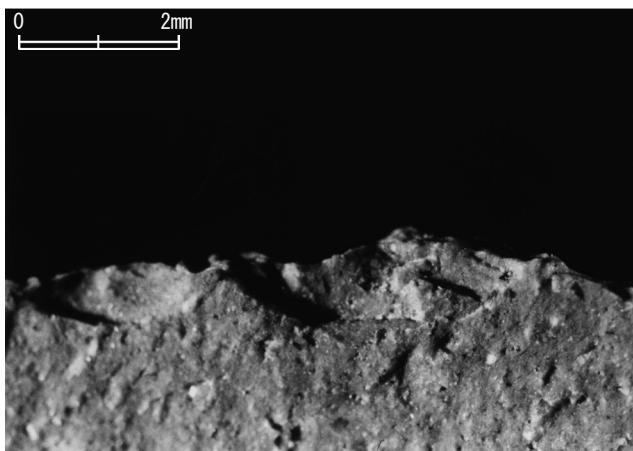
(2) 4.3-4. wood scrape 300st (SH90d) 4x



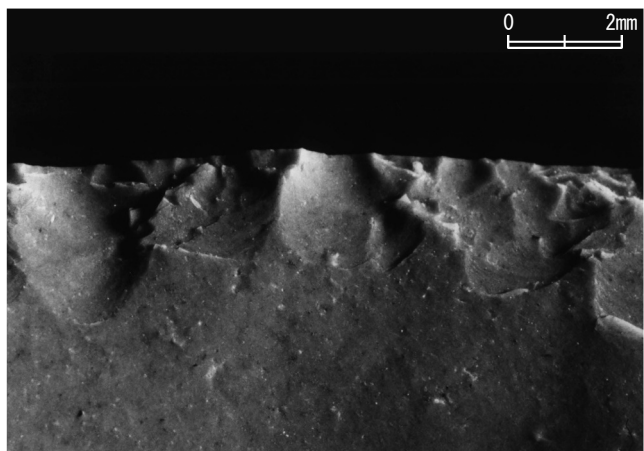
(3) 4.3-4. wood scrape 300st (SH90v) 4x



(4) 4.3-4. wood scrape 500st (SH120Bd) 5x

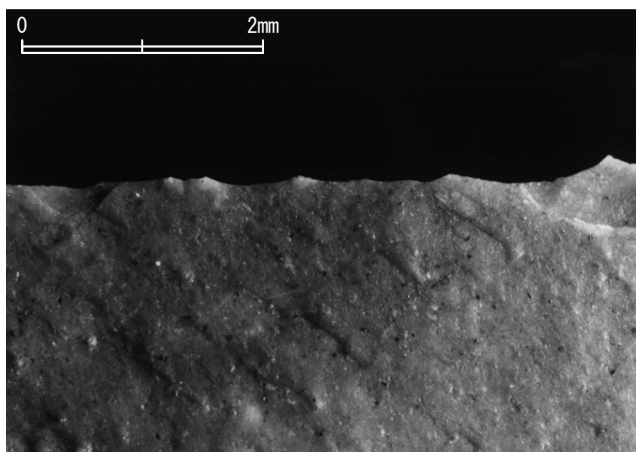


(5) 4.3-4. wood scrape 500st (SH120Bv) 5x

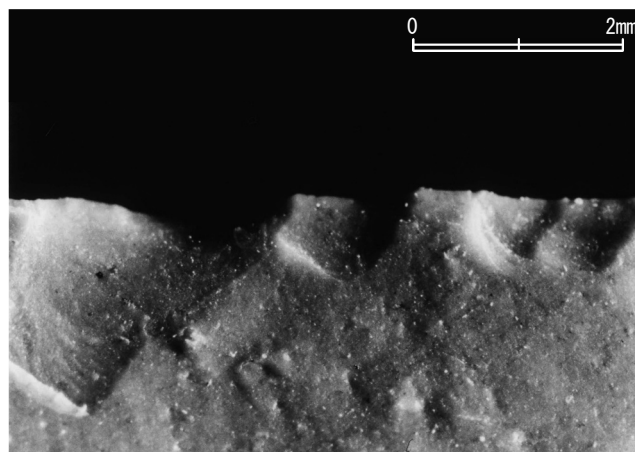


(6) 4.3-4. wood scrape 500st (SH149d) 3.5x

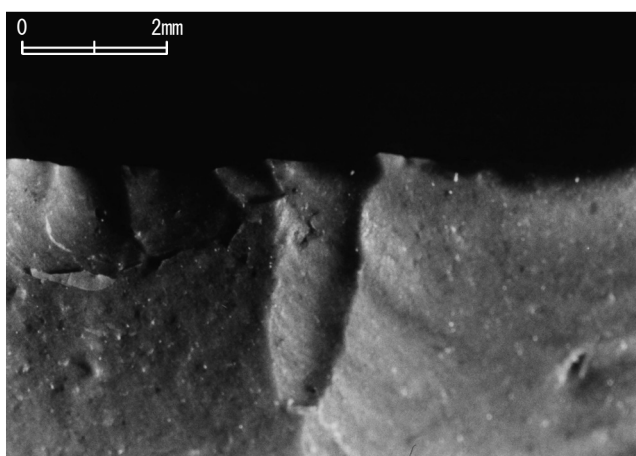
Figure 16. Experimental microflaking scars. (medium worked materials)



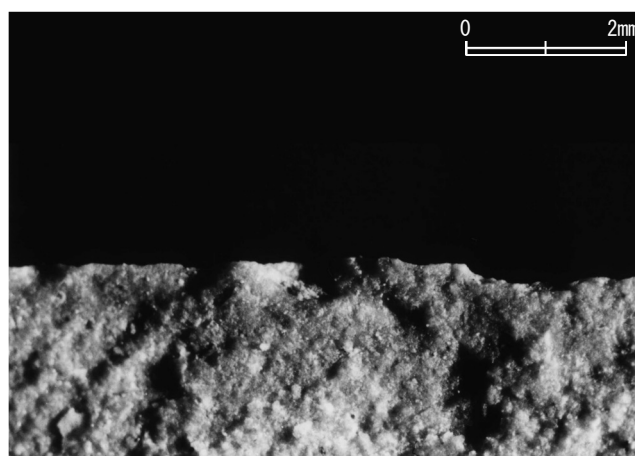
(1) 4.3-4. wood scrape 500st (SH149v) 8x



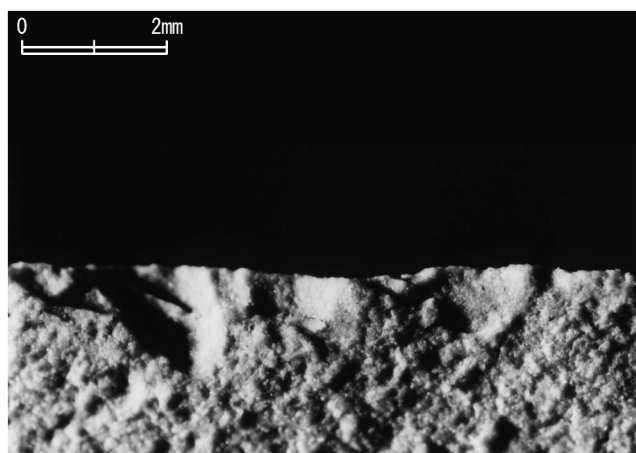
(2) 4.3-5. wood chop 200st (SH14d) 6x



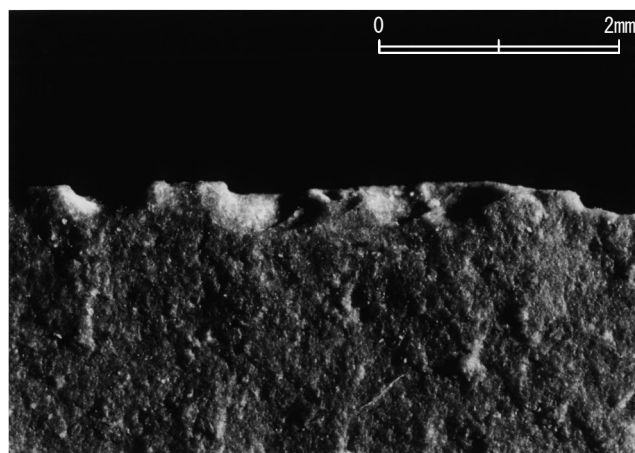
(3) 4.3-5. wood chop 200st (SH14v) 4x



(4) 4.3-5. wood chop 700st (SH152d) 5x

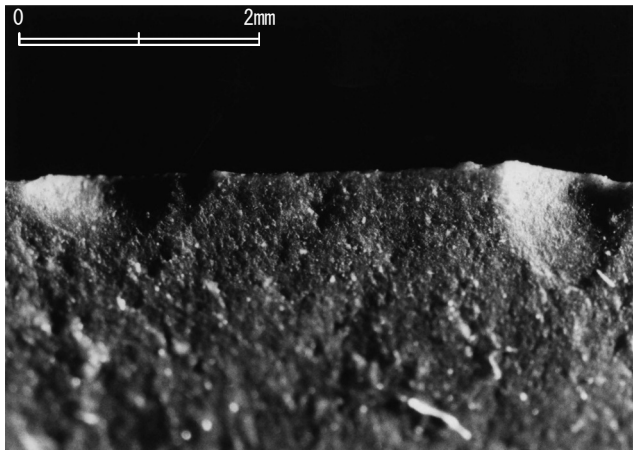


(5) 4.3-5. wood chop 700st (SH152v) 4x

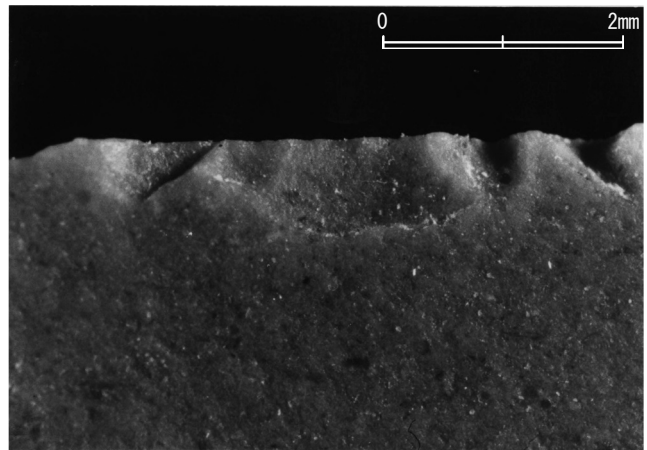


(6) 4.4-1. wood cut 1400st (SH7d) 8x

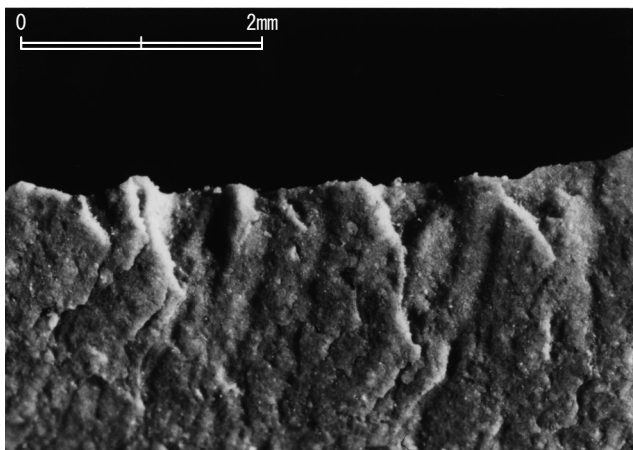
Figure 17. Experimental microflaking scars. (medium worked materials)



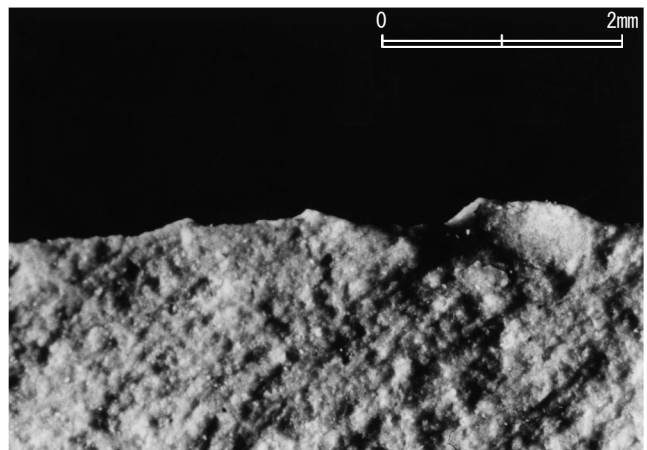
(1) 4.4-1. wood cut 1400st (SH7v) 8x



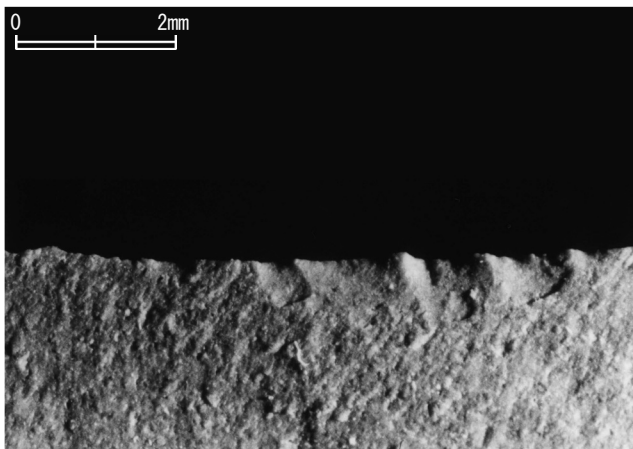
(2) 4.4-1. wood cut 2500st (SH8d) 8x



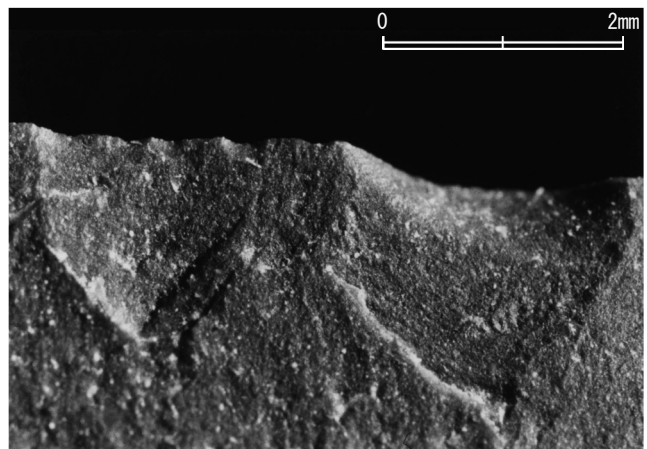
(3) 4.4-1. wood cut 2500st (SH8v) 8x



(4) 4.4-1. wood cut 1000st (SH9d) 8x

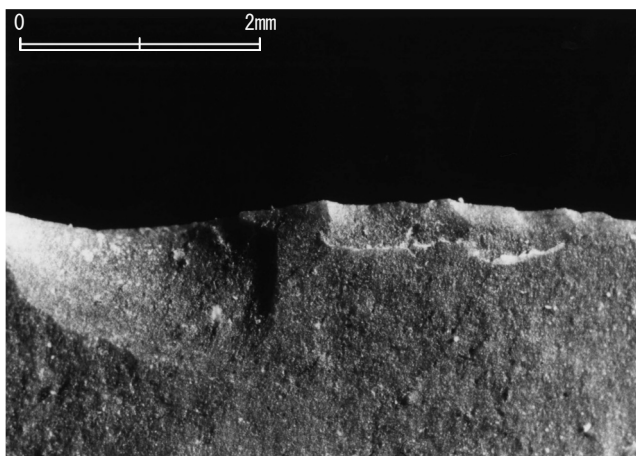


(5) 4.4-1. wood cut 1000st (SH9v) 5x

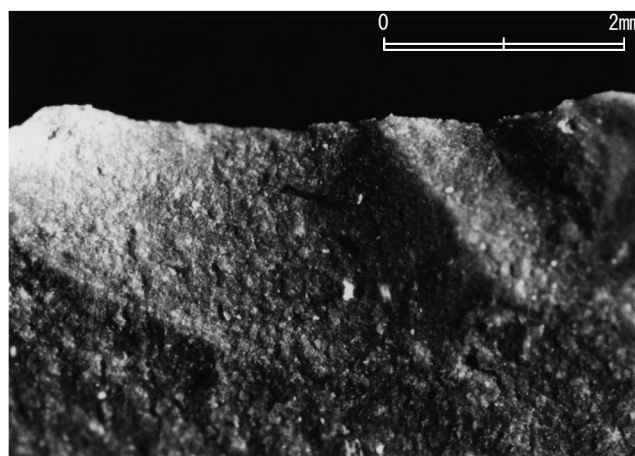


(6) 4.4-1. wood cut 2000st (SH10d) 8x

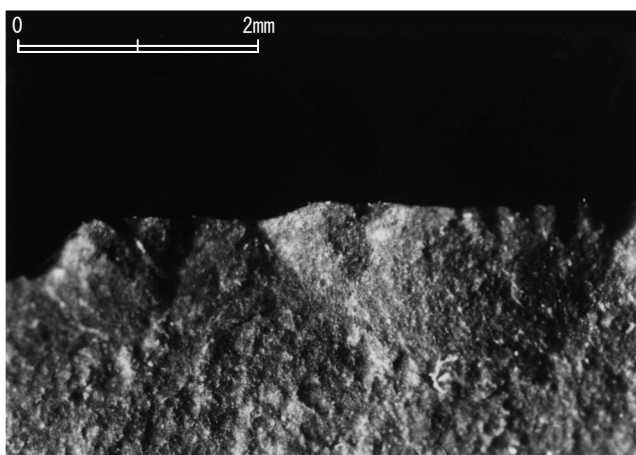
Figure 18. Experimental microflaking scars. (medium worked materials)



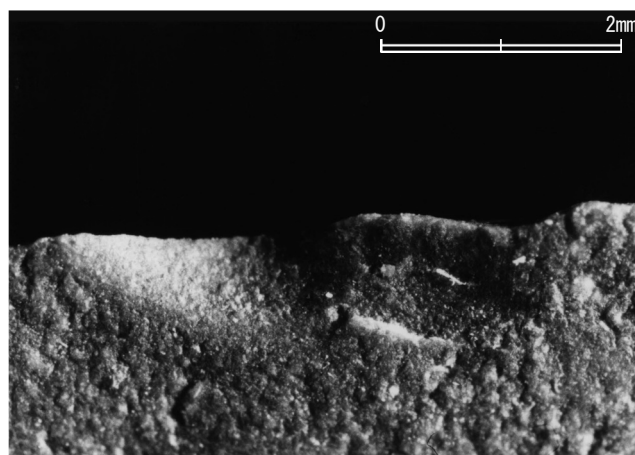
(1) 4.4-1. wood cut 2000st (SH10v) 8x



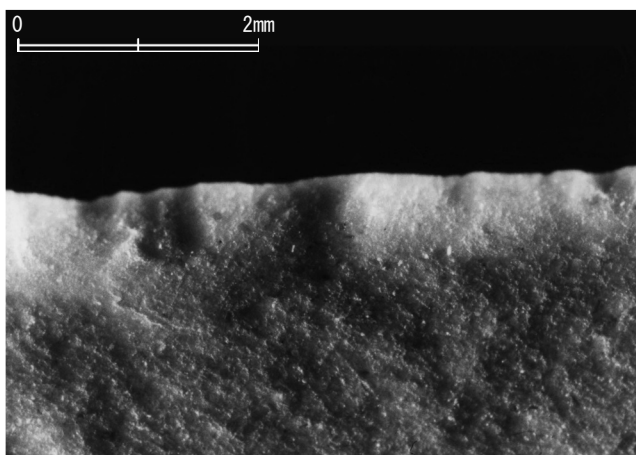
(2) 4.4-1. wood cut 3000st (SH12d) 8x



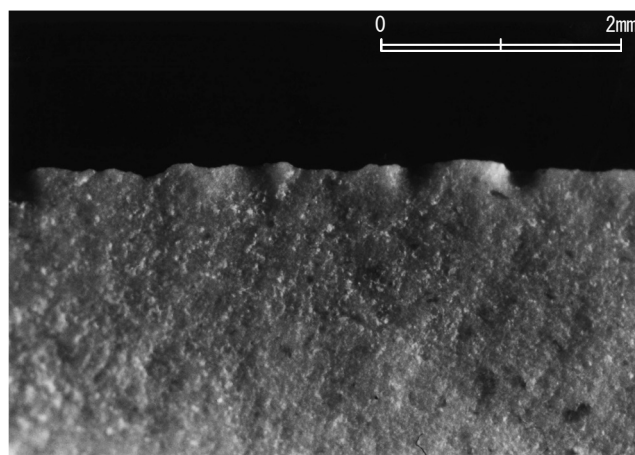
(3) 4.4-1. wood cut 3000st (SH12v) 8x



(4) 4.4-1. wood cut 3000st (SH12v) 8x

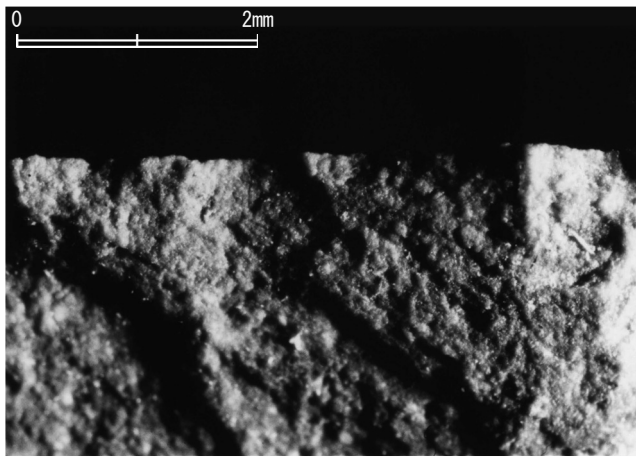


(5) 4.4-2. wood saw 5000st (SH49d) 8x

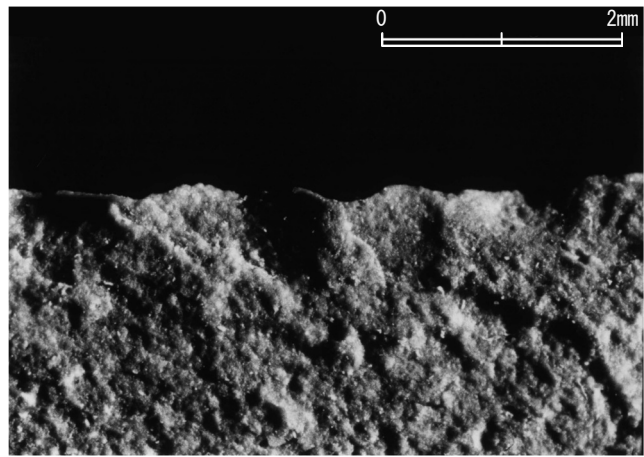


(6) 4.4-2. wood saw 5000st (SH49v) 8x

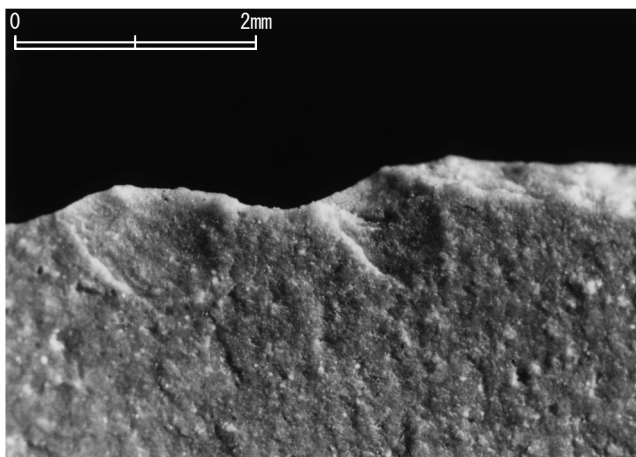
Figure 19. Experimental microflaking scars. (medium worked materials)



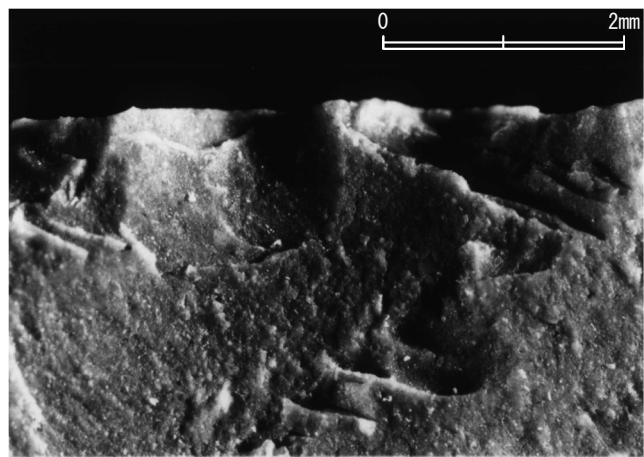
(1) 4.4-3. wood whittle 2000st (SH13d) 8x



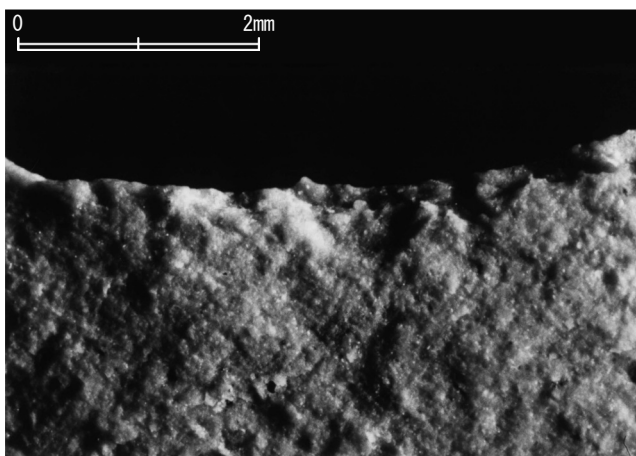
(2) 4.4-3. wood whittle 2000st (SH13v) 8x



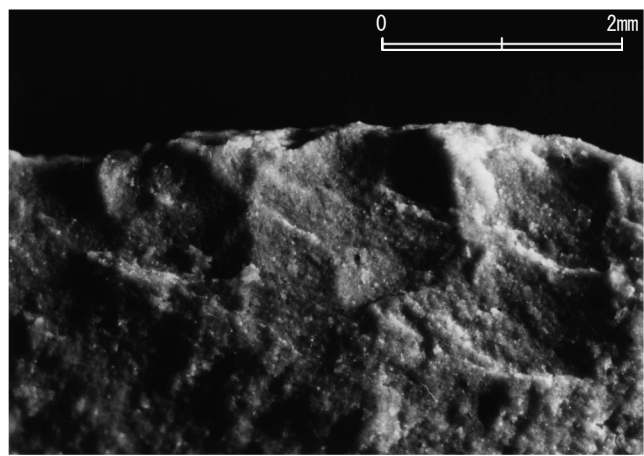
(3) 4.4-3. wood whittle 2000st (SH99d) 8x



(4) 4.4-3. wood whittle 2000st (SH99v) 8x

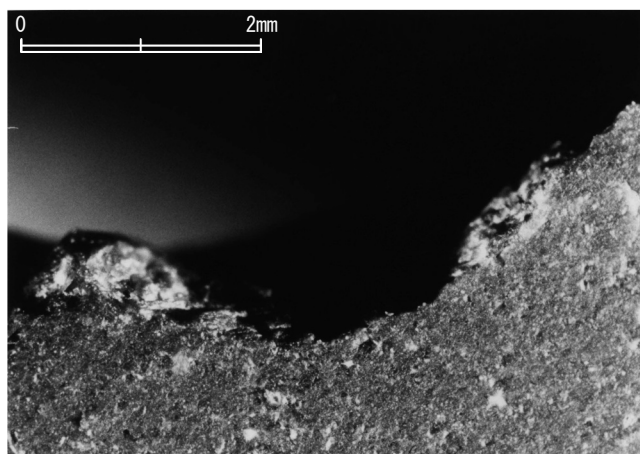


(5) 4.5-3. wood whittle (KSM9d) 8x

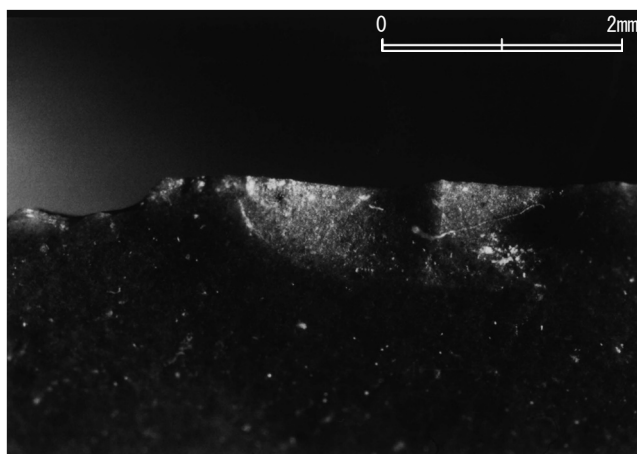


(6) 4.5-3. wood whittle (KSM9v) 8x

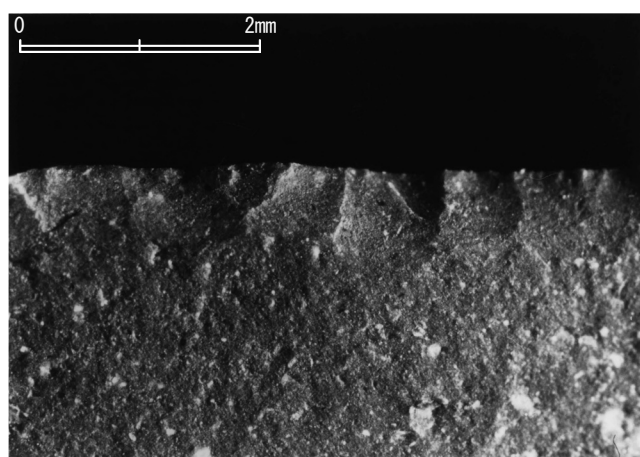
Figure 20. Experimental microflaking scars. (medium worked materials)



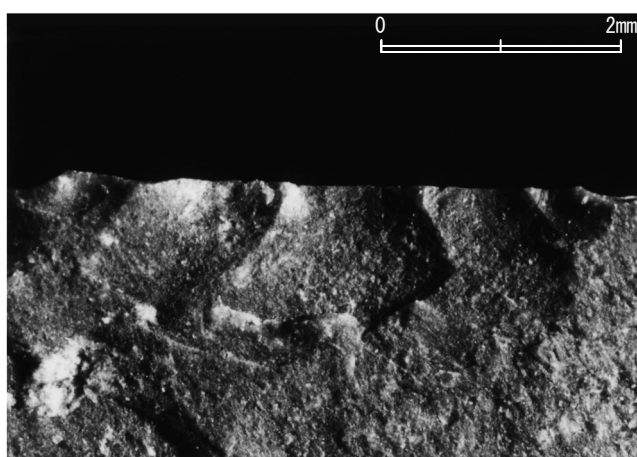
(1) 4.6-4. wood scrape 2000st (SH39v) 8x



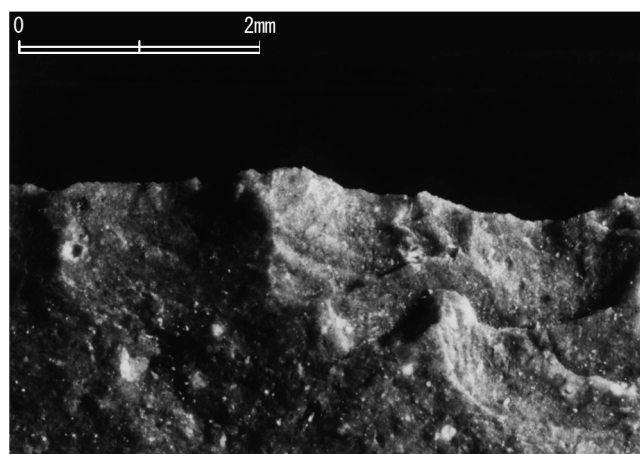
(2) 5.0-2. bamboo saw 2000st (SH79v) 8x



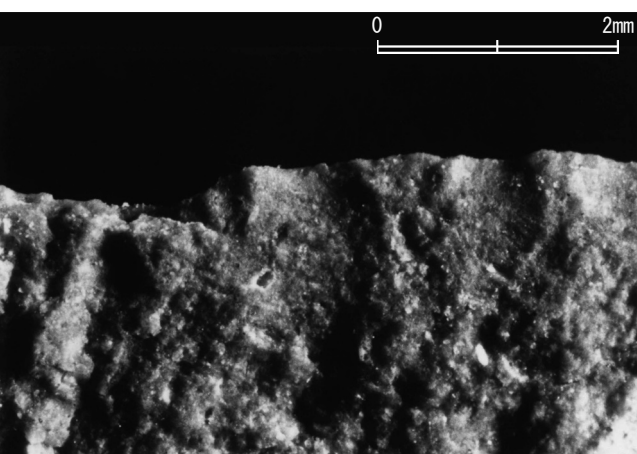
(3) 5.0-2. bamboo saw 4000st (SH80d) 8x



(4) 5.0-2. bamboo saw 4000st (SH80v) 8x

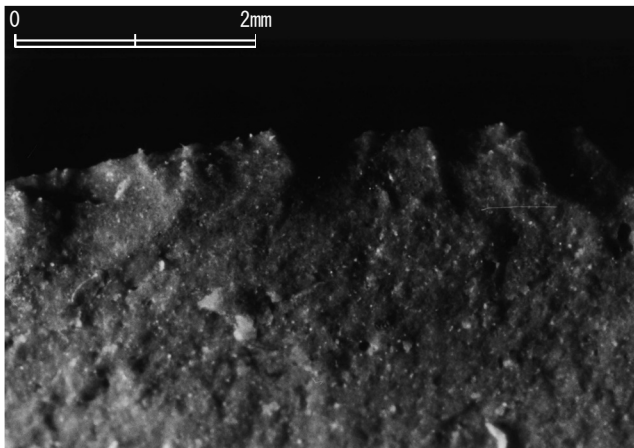


(5) 5.0-3. bamboo whittle (KSM21d) 8x

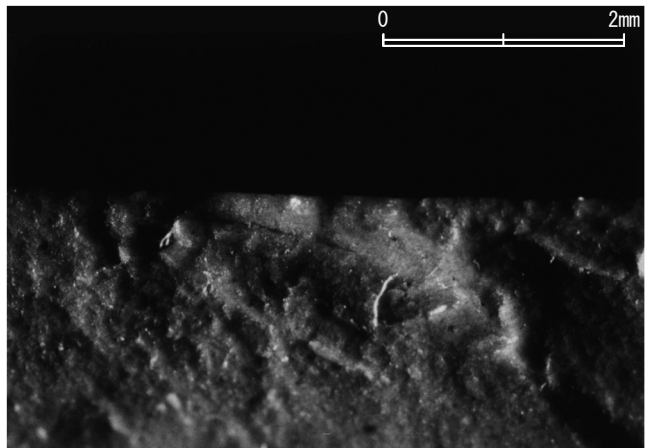


(6) 5.0-3. bamboo whittle (KSM21v) 8x

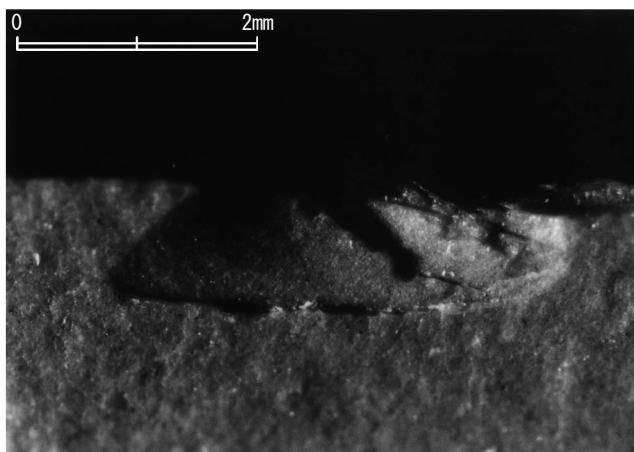
Figure 21. Experimental microflaking scars. (medium worked materials)



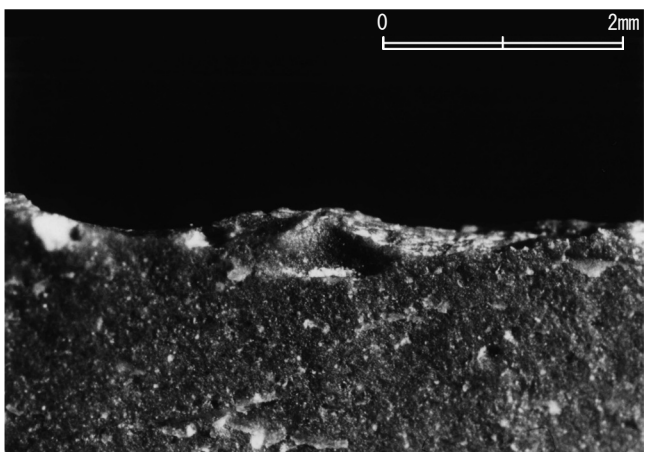
(1) 5.0-3. bamboo whittle (KSM23d) 8x



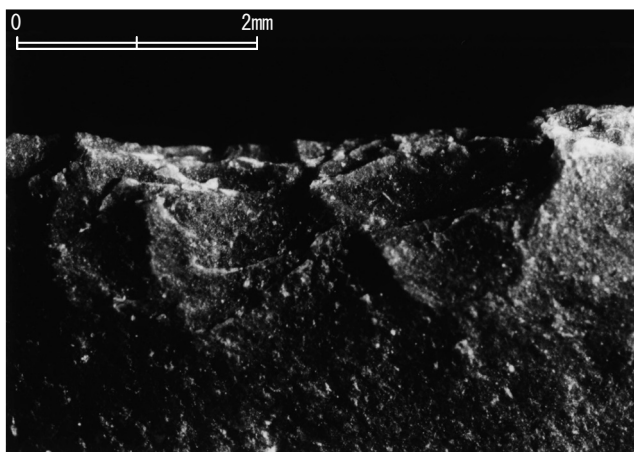
(2) 5.0-4. bamboo scrape 4000st (SH82) 8x



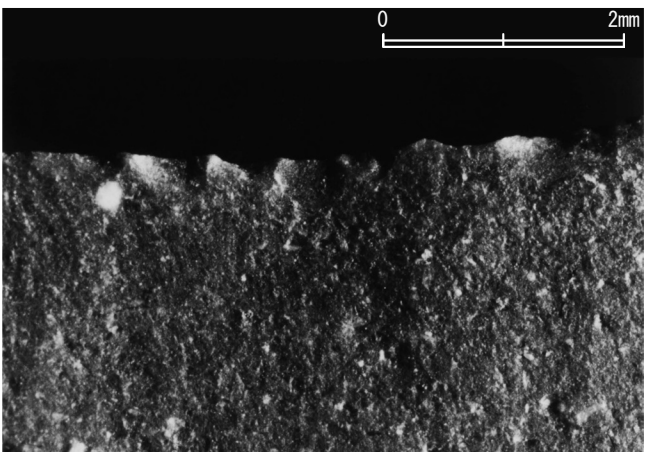
(3) 5.0-4. bamboo scrape 4000st (SH82d) 8x



(4) 5.0-4. bamboo scrape 2000st (SH84d) 8x

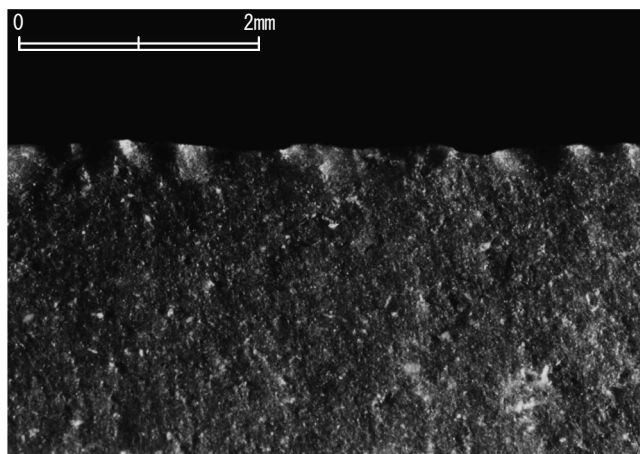


(5) 5.0-4. bamboo scrape 2000st (SH84v) 8x

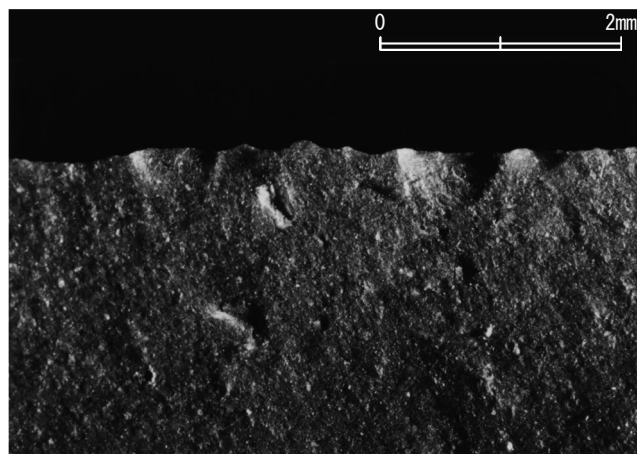


(6) 5.0-2. bamboo saw 2000st (SH79d) 8x

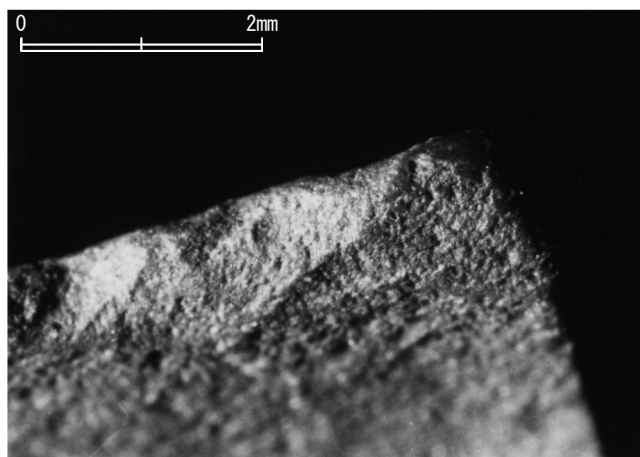
Figure 22. Experimental microflaking scars. (medium worked materials)



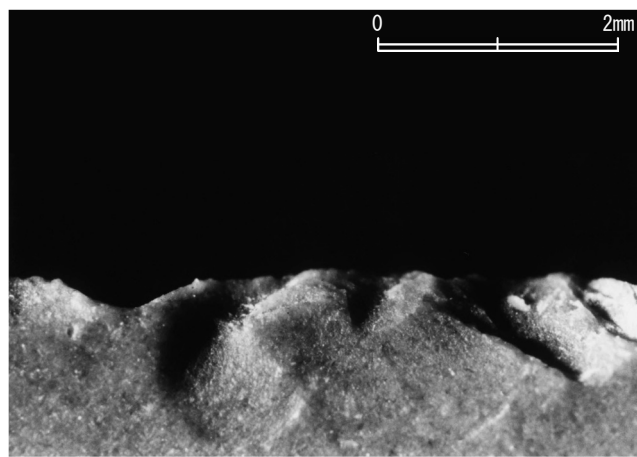
(1) 6.0-2. gourd saw 5000st (SH77d) 8x



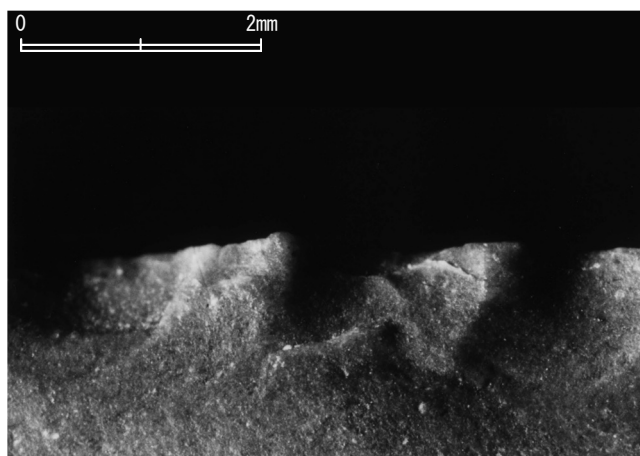
(2) 6.0-2. gourd saw 5000st (SH77v) 8x



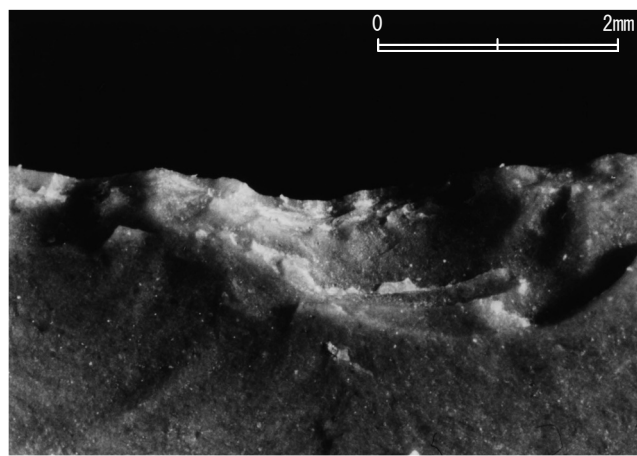
(3) 7.0-7. shell grave (KSM16d) 8x



(4) 8.1-2. bone saw 3000st (SH86d) 8x

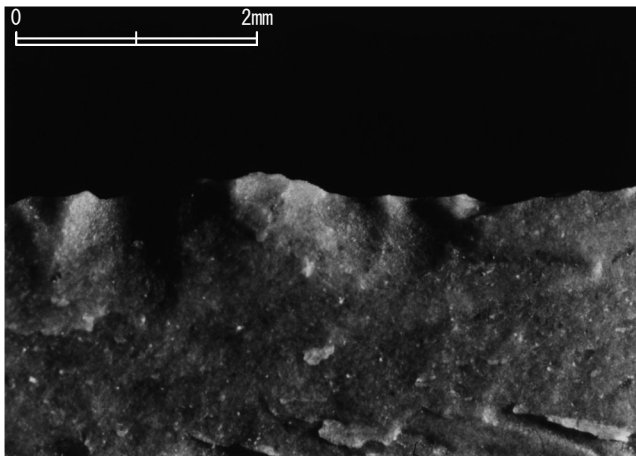


(5) 8.1-2. bone saw 3000st (SH86v) 8x

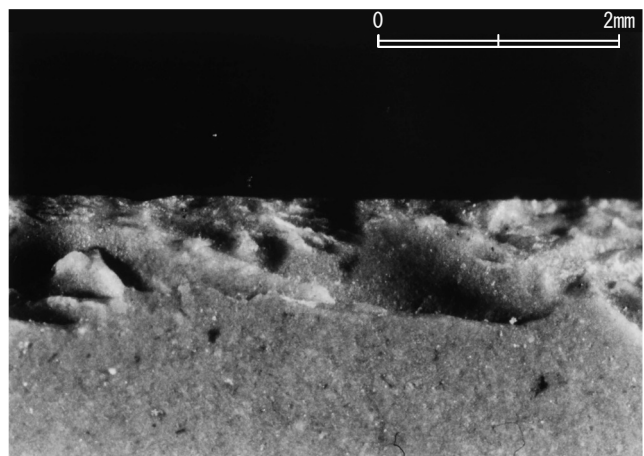


(6) 8.1-3. bone whittle 1100st (SH89d) 8x

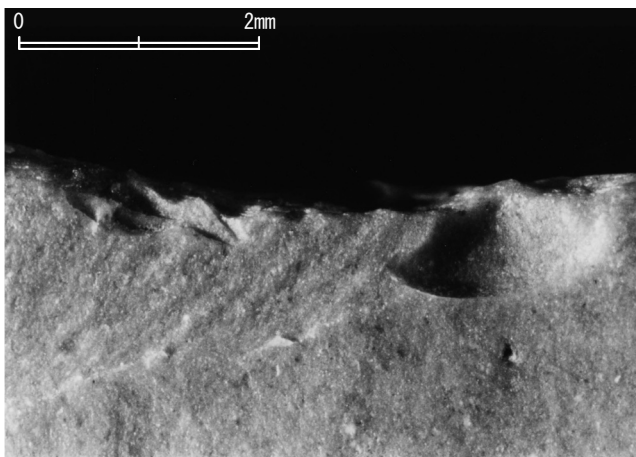
Figure 23. Experimental microflaking scars. (medium to hard worked materials)



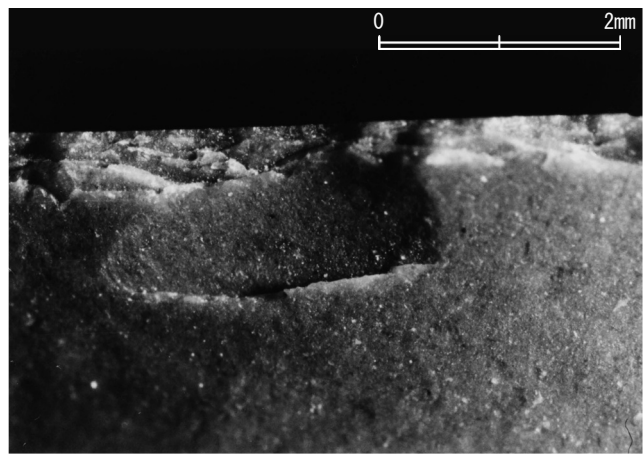
(1) 8.1-3. bone whittle 1100st (SH89v) 8x



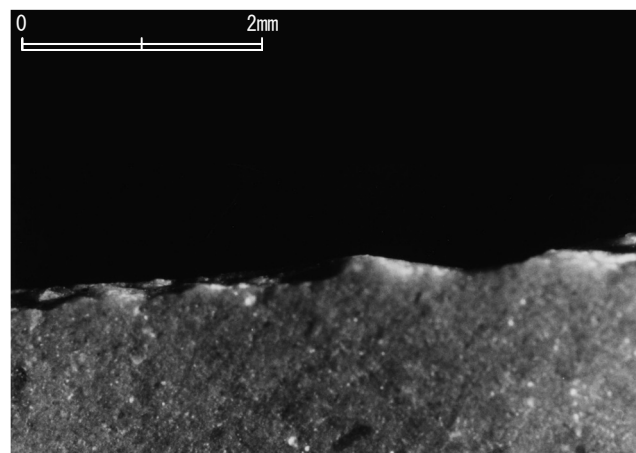
(2) 8.1-4. bone scrape 1000st (SH89d) 8x



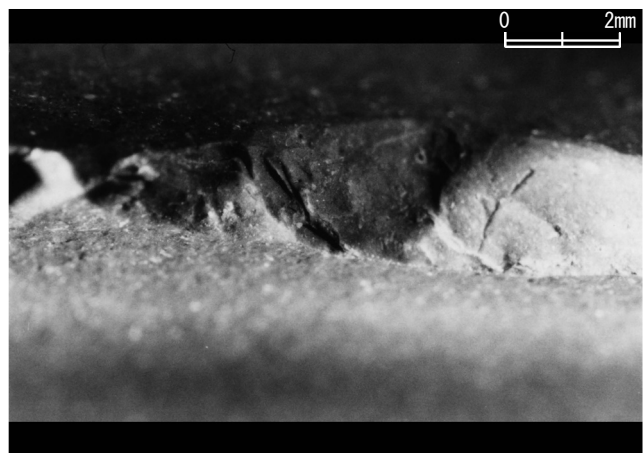
(3) 8.1-4. bone scrape 1000st (SH89v) 8x



(4) 8.2-4. bone scrape 1500st (SH93d) 8x

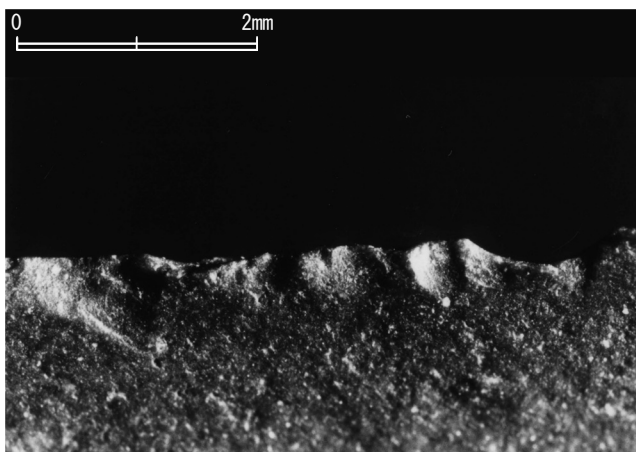


(5) 8.2-4. bone scrape 1500st (SH93v) 8x

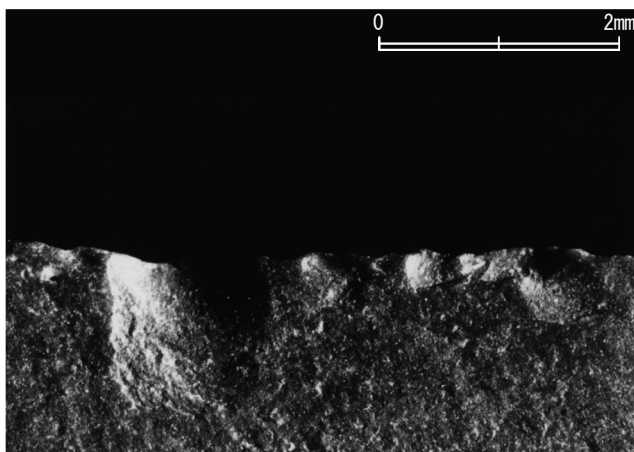


(6) 8.3-2. bone saw 500st (SH91) 3x

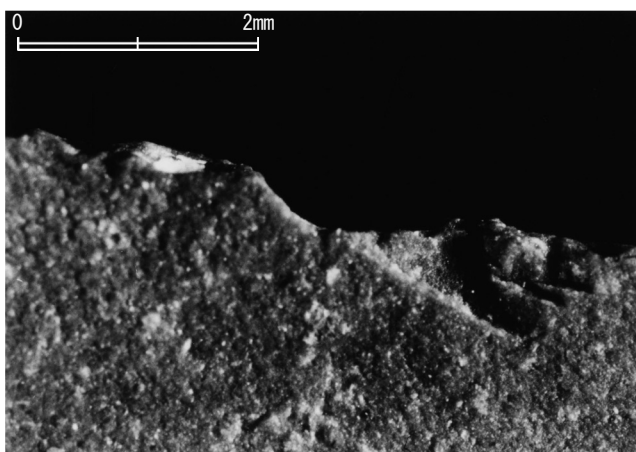
Figure 24. Experimental microflaking scars. (hard worked materials)



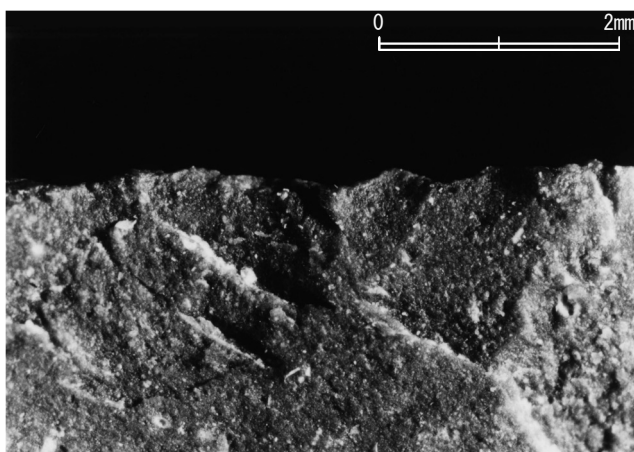
(1) 8.3-2. bone saw 5000st (SH92d) 8x



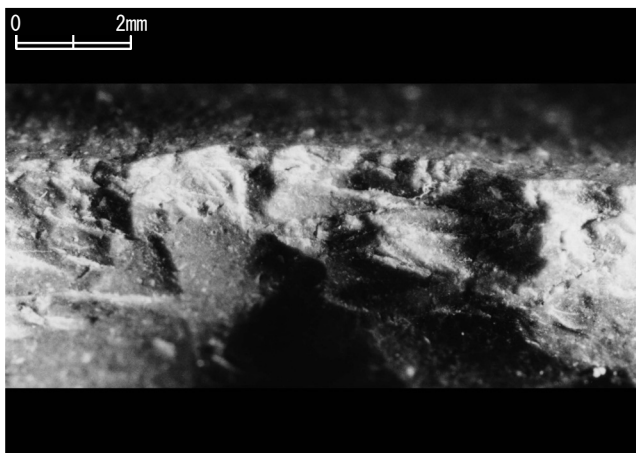
(2) 8.3-2. bone saw 5000st (SH92v) 8x



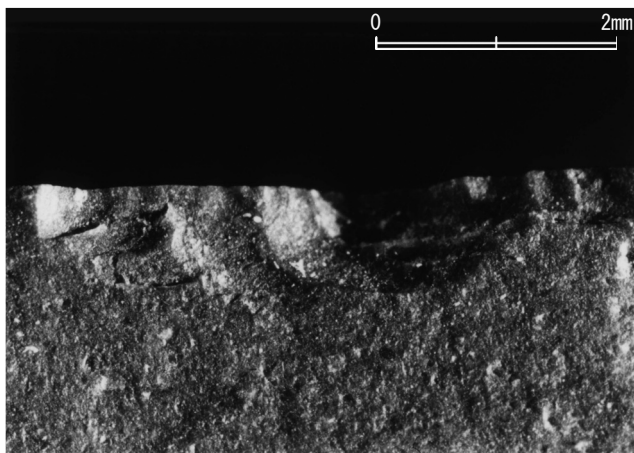
(3) 8.3-3. bone whittle 3000st (SH101d) 8x



(4) 8.3-3. bone whittle 3000st (SH101v) 8x

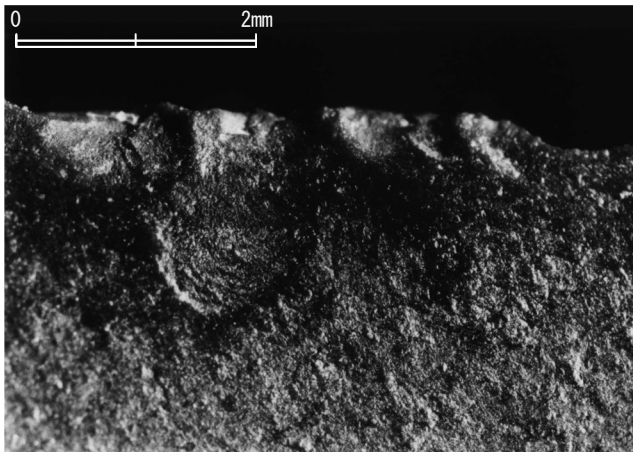


(5) 8.3-4. bone scrape 2000st (SH91) 3x

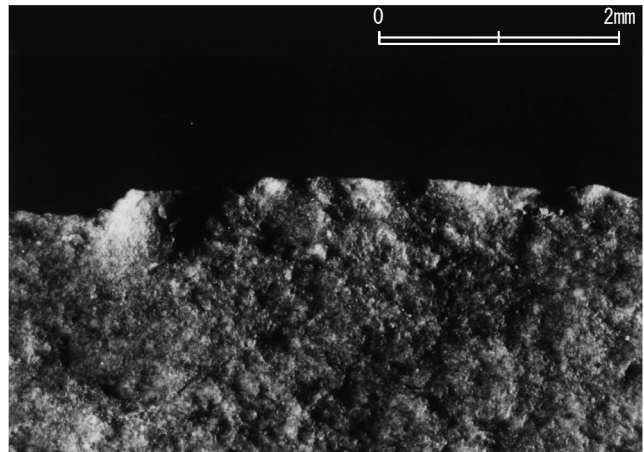


(6) 9.1-2. antler saw 4000st (SH47d) 8x

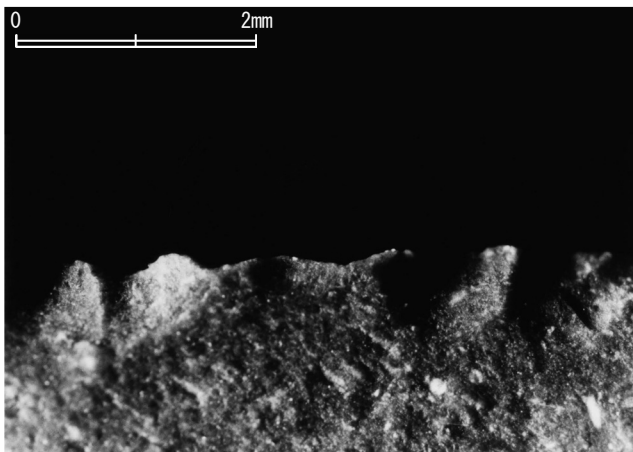
Figure 25. Experimental microflaking scars. (hard worked materials)



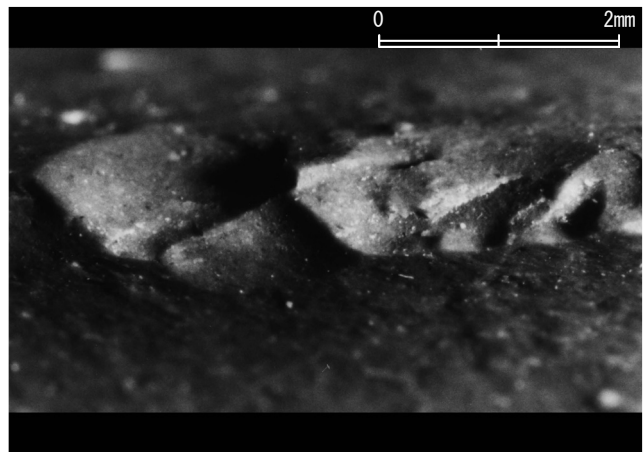
(1) 9.1-2. antler saw 4000st (SH47v) 8x



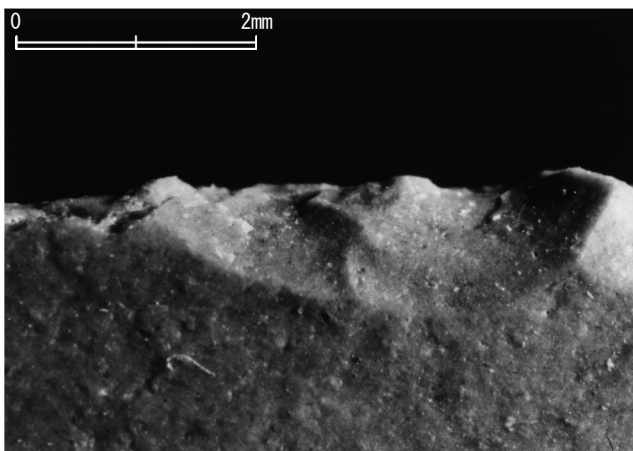
(2) 9.1-2. antler saw 15000st (SH48d) 8x



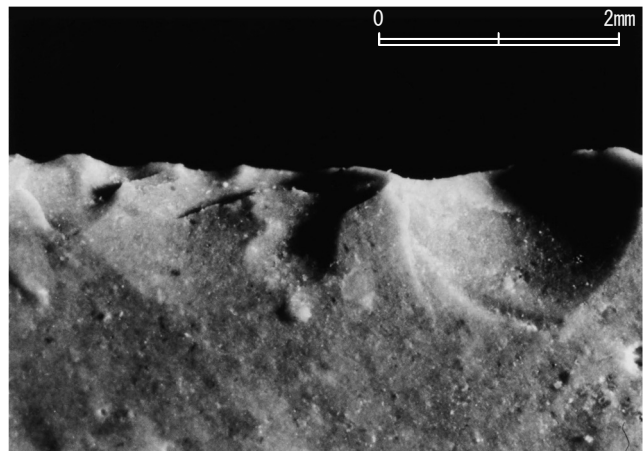
(3) 9.1-2. antler saw 15000st (SH48v) 8x



(4) 9.2-2. antler saw 4300st (SH68) 8x

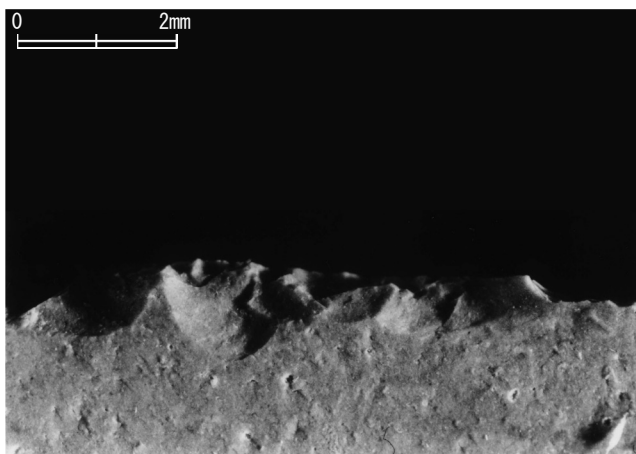


(5) 9.2-2. antler saw 4300st (SH68d) 8x

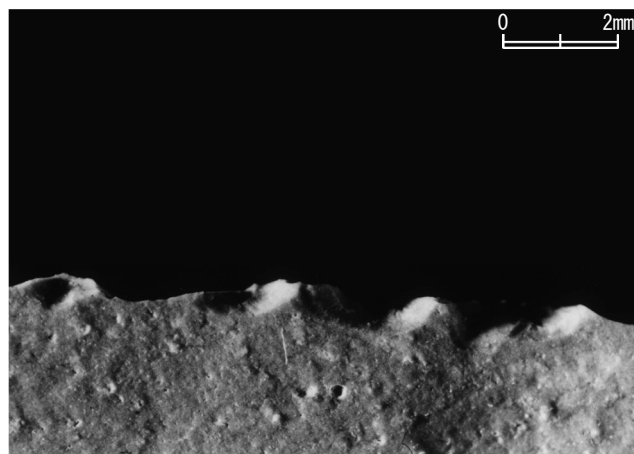


(6) 9.2-2. antler saw 4300st (SH68v) 8x

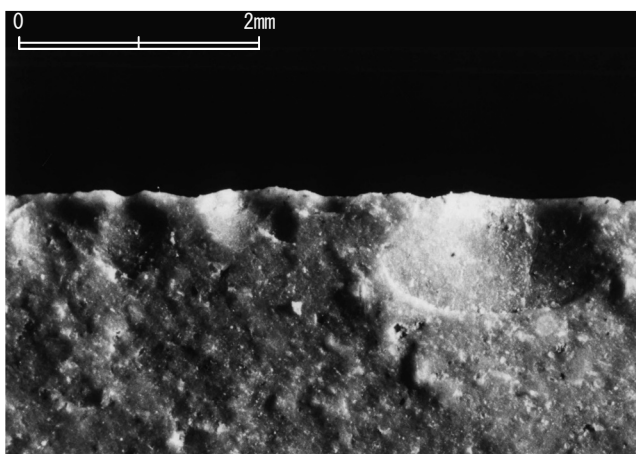
Figure 26. Experimental microflaking scars. (hard worked materials)



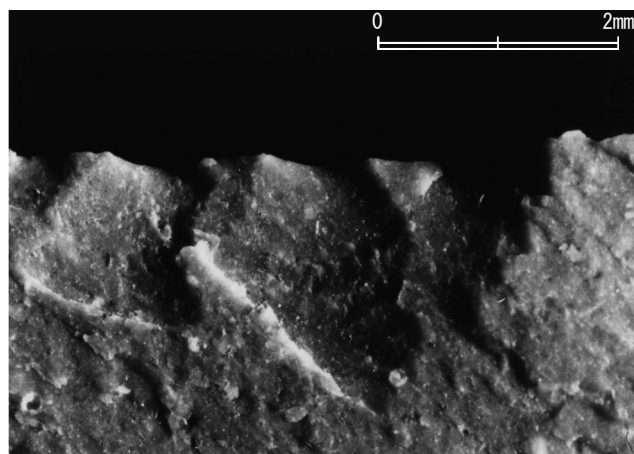
(1) 9.2-2. antler saw 1100st (SH71d) 5x



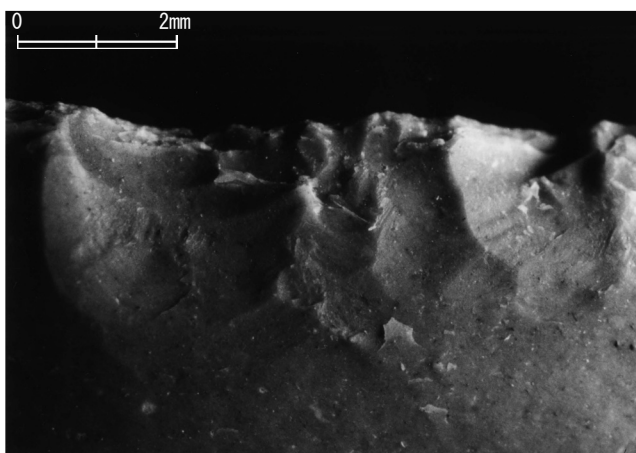
(2) 9.2-2. antler saw 1100st (SH71v) 3x



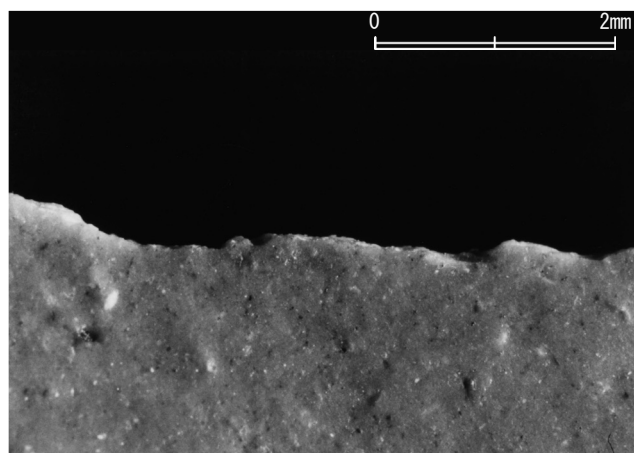
(3) 9.2-3. antler whittle 2000st (SH70d) 8x



(4) 9.2-3. antler whittle 2000st (SH70v) 8x

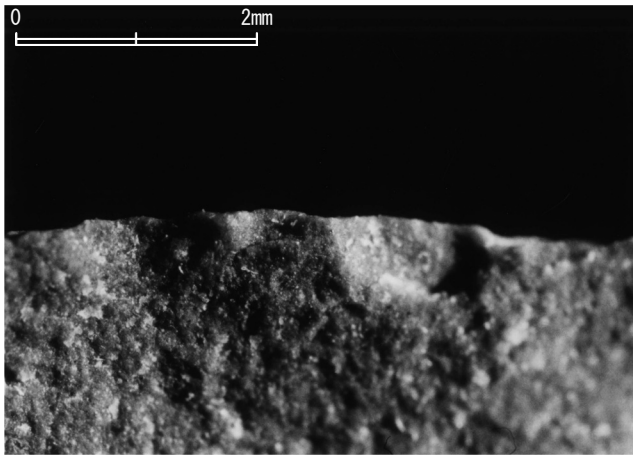


(5) 9.2-4. antler scrape 100st (SH153d) 5x

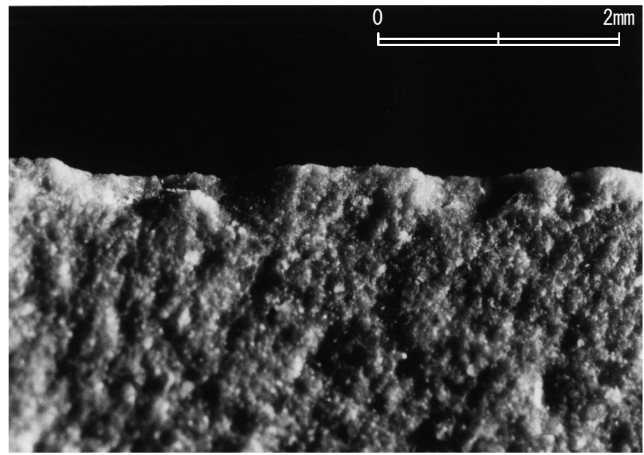


(6) 9.2-4. antler scrape 100st (SH153v) 8x

Figure 27. Experimental microflaking scars. (hard worked materials)



(1) 9.3-1. antler cut 1500st (SH16d) 8x



(2) 9.3-1. antler cut 1500st (SH16v) 8x

Figure 28. Experimental microflaking scars. (hard worked materials)

Experiment No.	Worked material	Details	Kind of action	Number of strokes	Polish type	Striation
1	plant	fresh wheat	cut	15m, 120min	BF1	○
7	wood	fresh alder	cut	1400	BB	○
8	wood	fresh alder	cut	2500	F2F2	×
9	wood	fresh alder	cut	1000	D2D2	○
10	wood	fresh alder	cut	2000	BF2	○
11	plant	fresh wheat	cut	25m, 30min	BB	○
12	wood	fresh alder	cut	3000	D2F2 BF2	○
13	wood	fresh alder	whittle	2000	BF2	○
14	wood	seasoned pine, no bark	chop	200	BF2	○
15	meat	half-frozen mutton	cut	500	F1E1	○
16	antler		cut	1500	F1F1	○
17	meat	half-frozen mutton	cut	1000	D2F1	○
20	plant	weed	chop-cut	1700	AA	○
26	meat	fresh cattle	cut	over 800	F1F2	○
39	wood	seasoned soft wood	scrape	2000	BF2	○
40	plant	reed	cut	3000	AA	○
42	plant	reed	cut	2650	AA	○
43	plant	fresh rice	cut	3000	AA	○
44	wood	fresh pine	saw2	2000	BB	○
45	plant	fresh rice crop	cut	about 3000	AA	○
46	wood	fresh pine	whittle	1500	BF2	○
47	antler	soaked	saw2	4000	CC	○
48	antler	soaked	saw2	15000	CC	○
49	wood	seasoned alder	saw2	5000	BB	○
54	meat	fresh pig	cut	1300	F2E1	○
55	meat	fresh pig	cut	1600	F2E1	○
56	chicken	half-frozen chicken	butcher	1020	F1F2E1	○
57	meat	fresh pig	scrape	1100	F1F2	
66	plant	pampas grass	cut	800	AA	○
68	antler	dry	saw	4300	D1F1	○
70	antler	dry	whittle	2000	F1F1	○
71	antler	dry	saw	1100	D2F1	○

Table 1. List of experiments by TUMRT for microflaking analysis. (1)

Experiment No.	Worked material	Details	Kind of action	Number of strokes	Polish type	Striation
76	hide	dry cattle	saw	5000	D1F1	○
77	plant	seasoned gourd	saw	5000	AB	○
79	bamboo	seasoned	saw	2000	BF1	○
80	bamboo	fresh	saw	4000	BB	○
82	bamboo	fresh	scrape	4000	BB	○
84	bamboo	seasoned	scrape	2000	BB(atypical)	○
86	bone	fresh pig	saw	3000	D2C	○
89	bone	fresh pig	whittle/scrape	2100	D1F1	×
90	wood	seasoned pine	scrape	300	F1F2	×
91	bone	boiled pig	scrape/saw	2000/500	D1F2	○
92	bone	boiled pig	saw	5000	D1C	○
93	bone	wet and boiled pig	scrape	1500	D1D1	
96a	wood	fresh cedar	whittle	1000	BF1	○
97	meat	fresh duck	cut	700	E1E2F1F2	
99	wood	seasoned alder	whittle	2000	BB(atypical)	
100	wood	seasoned pine	whittle	2000	BB	○
101	bone	boiled pig	whittle	3000	D2F1	
108a	duck		butcher	3 ducks	E1E2F1	
111	wood	fresh paulownia	scrape	1000	F1F2	
114	wood	fresh paulownia	whittle	1000	BF1	○
115	wood	fresh paulownia, outside wet, inside dry	saw	1000	BF1	○
120a	leather	pig	scrape	2000	F2F2	
120b	wood	pine	scrape	500		
121	leather	pig	scrape	2000	E1E2	○
122	rawhide	pig	scrape	2000	E2E1	○
123	rawhide	pig	scrape	2000	X	○
124	rawhide	pig	scrape	800	X	○
125	rawhide	pig	scrape	2000	X	○
126	rawhide	pig	scrape	2000	E2F1	○
128	rawhide	pig	scrape	2000	F1E1	○
129	rawhide	pig	scrape	4000	F2F2	○

Table 2. List of experiments by TUMRT for microflaking analysis. (2)

Experiment No.	Worked material	Details	Kind of action	Number of strokes	Polish type	Striation
130	hide	dry pig	scrape	1500	E2E2	
131	hide	dry pig	scrape	1500	E1E2	○
140	plant	fresh	cut	2200	AA	×
141	plant	wet and fresh pampas grass	cut	2200	AA	○
146	hide	pig	scrape	1000	E2F1	○
148	hide	pig	chop	306	F1F2	○
149	wood	seasoned pine	scrape	500	F2F2	×
150	wood	fresh cedar	scrape	500	F1F2	○
151	wood	fresh cedar	scrape	1000	D2F2	○
152	wood	seasoned pine	chop	700	D1F1	○
153	antler	dry	scrape	100	F1F1	○
180 (KSM5)	meat	fresh pig	cut	not counted		
184 (KSM9)	wood	zelkova	whittle	not counted		
187 (KSM12)	plant	fresh sedge	cut	not counted		
191 (KSM16a)	shell		grave	not counted		
191 (KSM16b)	wood	cedar	whittle	not counted		
195 (KSM20)	wood	cedar	whittle	not counted		
196 (KSM21)	bamboo		whittle	not counted		
198 (KSM23)	bamboo	seasoned	whittle	not counted		
201 (KSM26)	wood	cedar	whittle	not counted		

Table 3. List of experiments by TUMRT for microflaking analysis. (3)