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SIR,

A technique for producing strain-free flat surfaces on single crystals of ice

The paper by Tobin and Itagaki (1970) reminds me of a possibly useful experiment made many years ago in a cold room at the U.S. Snow, Ice and Permafrost Research Establishment. Rods $5 \times 1 \times 0.5$ cm were cut from a Mendenhall Glacier single crystal with the long dimension approximately parallel to the *c*-axis. At $-10°$ C the rods were broken by slowly pressing over the edge of a bench. They usually broke in cleavage normal to the *c*-axis, yielding apparently perfectly flat mirror surfaces.

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REFERENCE

Tobin, T. M., *and* Itagaki, K. 1970. Instruments and methods. A technique for producing strain-free flat surfaces on single crystals of ice. *Journal of Glaciology*, Vol. 9, No. 57, p. 385–90.

SIR,

A technique for producing strain-free flat surfaces on single crystals of ice: comments on Dr H. Bader's letter

I have tried the method described in the letter by Dr Bader although my previous experience with the method never produced satisfactorily flat surfaces. Usually the upper half to two thirds of the fractured surfaces were flat and mirror-like. However, careful observation of about a dozen surfaces examined revealed that none were crystallographically flat and smooth, unlike the cleaved surfaces of NaCl. The surfaces were always slightly curved and often showed surface patterns resembling conchoidal cleavage or Lüder lines. Consequently, the method was inadequate for the surface self-diffusion study. I wonder if the method can produce perfectly flat surfaces of appreciable size and if so, with what probability.

Micro-hardness tests were conducted immediately after preparation by Bader's method and again about 24 h later. I found no appreciable difference between them and the value agreed with the freeze tap method, which indicates that the surface is strain-free. The thermal etch pit density was $3 \times 10^4/\text{cm}^2$, typical of the bulk density of this type of specimen and no appreciable change is observed during sublimation, which supports the conclusion that the method is strain-free.

Bader's method may be useful in certain cases because it is strain-free, although the size and orientation of the surface is limited, and the waste of the material is quite large.

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