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APPLICATION OF PLASTIC PEEL TECHNIQUES TO THE STUDY OF SILICATE ROCKS

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The plastic peel techniques described by McCrone (1963), Stewart and Taylor (1965) and Frank (1965) provide easily and cheaply prepared supplements to thin sections for studies of carbonate rocks. A sheet of plastic, placed on the rock surface, is softened by a solvent which then evaporates; the plastic conforms in minute detail to surface irregularities such as grain boundaries, cleavages and etch pits. The plastic is peeled off and bears a reverse replica of the microtopography of the rock surface.

The plastic peel method can be applied to silicate rocks. Dollar (1942) and Bissell (1957) strongly endorsed this application; igneous and metamorphic petrologists generally have ignored the technique. This note is intended to reaffirm and extend the usefulness of peels in "hard rock" petrology.

Most minerals in a rock differ sufficiently in habit, cleavage, and etching behavior to be easily discriminated in peels. After being sawed and ground with No. 600 abrasive, the rock surface must be cleaned and dried. If the purpose of a peel study is to determine modal proportions and textural relations of quartz, glass, or other materials without cleavage, etching is not necessary; the effects of grinding will distinguish these from minerals with cleavage. For other materials, adequate etching is usually accomplished in 15 seconds by HF vapor at 20° C.

After etching, some minerals may be selectively stained by direct absorbtion of a dye, or by the use of reagents to produce a colored reaction product on the etched surface of the mineral. When a peel is made of the stained surface, reaction stains, such as potassium cobaltinitrite on K-feldspar and a barium "salt" of the dye F.D. and C. Red No. 2 (amaranth) on plagioclase (Laniz *et al.*, 1964), transfer to the plastic as it is detached. Absorbtion stains, such as methylene blue on nepheline, do not transfer satisfactorily. Trial and error will quickly show the best combination of reflected and transmitted light for studying stained peels.

In the flexible peel technique, the rock surface is covered with acetone, and a sheet of colorless cellulose acetate (drafting acetate) about 0.006 inch thick is carefully applied as described by McCrone (1963). The plastic detaches itself from the rock in ten to twenty minutes, and must be bound between glass plates to prevent curling.

In the rigid peel method (Frank, 1965) the rock surface is held horizontal and flooded with ethylene dichloride. A sheet of plexiglass larger than the rock surface and 1/16 to 1/8 inch thick is carefully lowered onto the rock surface, avoiding the trapping of air bubbles. The plexiglass is allowed to bond to the rock by the solvent action of ethylene dichloride for at least one hour at room temperature; it is then detached by prying or bending. Scrap plexiglass and ethylene dichloride may be purchased cheaply from most plastics supply firms. Unlike acetate peels, plexiglass peels do not curl after removal from the rock and need not be mounted between glass plates. They are thus more useful for studies at high magnification using objectives of short focal length, because no overlying plate of glass interferes.

A peel can be made in less than a tenth of the time required to make a thin section, at a cost of about 25 cents, and may cover several times the area of a standard thin section.

In modal analysis of thin sections or slabs, errors arise because the observer sees into the rock and nonvertical grain boundaries of colored and opaque minerals may deceive him into overestimating the abundance of these constituents. In peels, observation is confined to a two-dimensional surface and such counting errors do not occur. If careful thin section study precedes the modal analysis of stained peels, identification errors can be minimized. Peels thus permit economical determination of modes for coarse, variable, or porphyritic rocks.

Serial peels can be taken at regular intervals through a rock, permitting study of complex intergrowths in three dimensions (Fig. 1).

Peels can be projected as lantern slides and used as negatives for enlargements. Contact prints can be made from stained acetate peels; un-

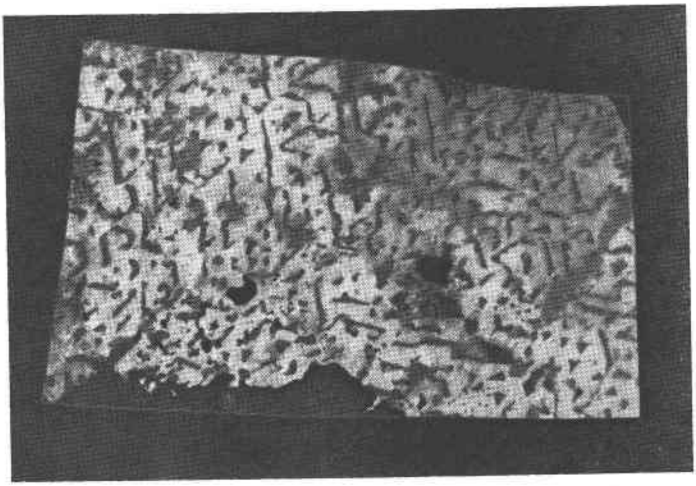

FIG. 1. Negative contact print of acetate peel, graphic granite, Bedford, New York, etched by HF fumes for 15 seconds and stained with sodium cobaltinitrite solution. K-feldspar, white; quartz, dark; albite-rich areas are intermediate shades. Natural size.

stained peels have too low contrast, and plexiglass peels give blurred images due to internal reflection.

Cleavages and grain boundaries have much higher relief in peels than in thin sections, owing to the greater difference in refractive indices between the plastic and air than between minerals and a mounting medium.

One of the most promising applications of the peel technique is in the rapid and precise discrimination of rock types within mapped units. For example, welded and nonwelded textures in pyroclastic rocks can be differentiated by examination of peels with a binocular microscope or hand lens. In the study of any map unit where textural or modal variation is suspected, peels will indicate where additional thin sections are most needed.

For teachers of petrography, peels supply useful, uniform material for illustrating textures and for practice in estimating modal percentages, and, at an early stage in his career, acquaint the student with a technique which has been too long neglected.

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"KAMACITE AND TAENITE SUPERSTRUCTURES AND A METASTABLE TETRAGONAL PHASE IN IRON METEORITES"—CORRECTION

(A. R. RAMSDEN AND E. N. CAMERON, *Am. Mineral.* **51**, 37–55)

The suggested existence of a metastable tetragonal phase in iron meteorites is incorrect. Subsequent investigation has indicated misalignment of the collimator in the *x*-ray powder camera, and the lines attributed to the tetragonal phase have been positively identified as due to the plasticene in which the short fibers were mounted. These lines appear in the patterns for the scratch samples only because of the long exposures involved. However, the lines attributed to the kamacite and taenite superstructures are not due to this material. The evidence for these superstructures depends primarily on comparison with the pattern from the Linville meteorite. As a check, Louis Fuchs (Argonne National Laboraorty) has kindly *x*-rayed our two scratch samples from this meteorite. A number of spotty lines were present on his patterns and he has suggested that this indicates the presence of two crystalline impurities. So far we have been unable to determine what these might be. Furthermore, it would seem to be a remarkable coincidence that the lines of the Linville pattern can be indexed in terms of the cubic lattices, one having a cell edge twice that of the taenite in the corresponding drilled sample and the other having a cell