Optically, the zinc-rich micas from both Sterling Hill and Franklin have a small optic angle, usually in the range 0° to 6°. X-ray spacing data obtained from diffractometer charts taken in Cu radiation with Si as internal standard did not show much variation in the material of analyses 1 to 7, with $d(060) \sim 1.545$A, $d(006) \sim 1.681$A and $d(200) \sim 2.634$A; the mica of analysis 9 had $d(200) = 2.622$A. The polytypism of these and of other micas from both Sterling Hill and Franklin will be described elsewhere. Phlogopite lacking significant amounts of Zn and Mn occurs at both localities but is generally confined to the marble country rock. An extended search has failed to find micas from these localities or from Långban, Sweden, that contain Mn as the dominant trioctahedral cation.

The zincian and manganoan pyroxenes and amphiboles associated with mica at Sterling Hill and Franklin have been described by Frondel and Ito (1966) and by Klein and Ito (1968). On the whole, these minerals have a considerably lower Zn/Mn ratio than do the micas.

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THE REFRACTIVE INDEX OF EXPERIMENTALLY HYDRATED RHYOLITE GLASS[1]

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During their study of hydrated rhyolite glass, Ross and Smith (1955) observed that the refractive index of naturally hydrated rhyolite glass was related to the water content of the glass. They further observed that heating of the glass and stepwise dehydration yielded a refractive index-water content curve with an abrupt change in slope at about 0.4 percent H_2O. Their curve is shown as the dashed curve in Figure 1.

During our study of rhyolite glass, we decided to investigate the relationship between refractive index and water content, with a view to

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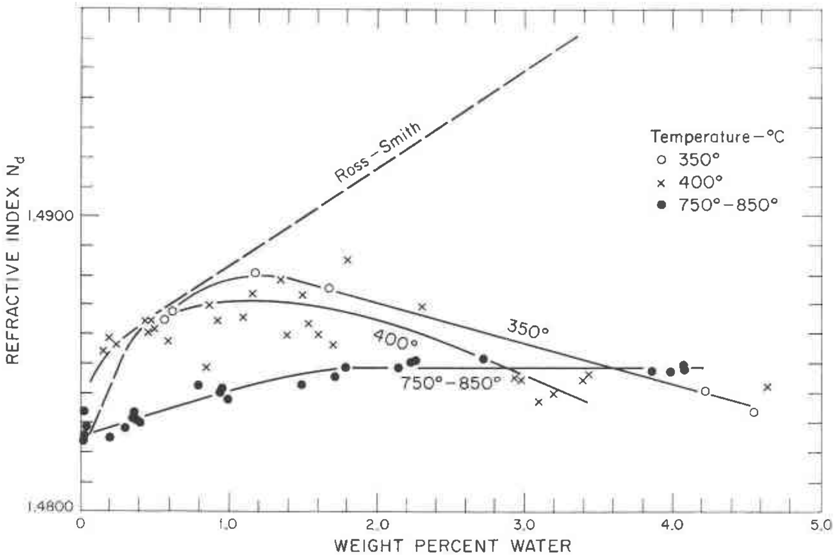

FIG. 1. Relationship of the refractive index of naturally hydrated rhyolite glass to water content.

using the index to determine the water content of experimentally hydrated glasses. We used samples of obsidian that had been hydrated at various temperatures and pressures in a previous investigation aimed at establishing the relation between water pressure and temperature on the water content of rhyolite glass (Friedman, Smith, and Long, 1966). The material used came from a single piece of obsidian that had been crushed, acid-washed, dried, and sieved. The use of uniform starting material ensured that the chemical composition (other than water content) of all samples would be the same.

EXPERIMENTAL

The refractive index was determined to ± 0.0002 by matching the index of the obsidian grains with an immersion oil, using sodium light and double inclined illumination to match indexes. Immediately upon securing a close match between the mixed oil (mixtures of light petroleum oil and α monochloronapthalene) and the glass specimen, a drop of the oil was placed in a Bausch and Lomb precision refractometer and its index determined. The tempertature in the room was constant to within 0.5°C during the course of a determination. The refractometer was calibrated using glass samples supplied by the glass section, U. S. Nat. Bur. Stand. It was possible to repeat index determinations made several weeks apart to within 0.0002. Although the first determinations took about two hours each, the senior author found that with long practice the time could be cut to about one hour. The procedure was to mix oils until an exact match was made, and then to read the index of the oil on the refractometer, which was positioned close to the microscope to minimize temperature variations.

All of the grains examined in the samples reported on in this paper appeared to have a uniform index.

Results

The results of our investigations are shown in Figure 1.

From this figure, it can be seen that the shape of the refractive index (Nd) versus water content curves for the experimentally hydrated samples depends on the temperature at which the samples were hydrated. The lower the hydration temperature (and pressure), the closer the curve to the Ross-Smith curve (Fig. 1).

This then might be taken as an indication that the naturally hydrated glasses investigated by Ross and Smith did hydrate at low temperatures, as originally suggested by them.

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STRESS-CORROSION FAILURE AND THE HYDRATION OF GLASSY SILICIC ROCKS[1]

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The steps in the hydration of glassy silicic rocks can be reconstructed from petrographic and field relations. As seen in thin section, hydrated aphyric glassy rocks typically are traversed by an interlocking network of fractures that divide the rock into innumerable equant or, less commonly, pencil- or lath-shaped bodies. In many cases the glass immediately adjacent to these curviplanar primary fractures is stained by iron oxides, partially devitrified, argillized, etc., or rendering the fractures distinguishable on a nongeometric basis from later fractures.

The blocks of glass bounded by the primary fractures contain numerous concentric perlitic fractures. The outermost of the perlitic cracks parallel the margins of the isolated blocks whereas towards the centers the fractures approach a spherical configuration. The origin of perlitic fractures as a result of secondary hydration has been conclusively demonstrated by Ross and Smith (1955), Friedman and Smith (1958), and Friedman and others (1966). Perhaps the best evidence is provided by

[1] Mineralogical Contribution No. 456.