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VISCOUS FLOW BEHAVIOR OF LUNAR COMPOSITIONS 14259 and 14310 by

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The viscous flow behaviors of lunar compositions 14259 and 14310 have been determined over a wide range of viscosity. Measurements have been carried out using a combination of rotating cylinder and bending beam viscosimeters to cover the range from 1 to 10^{14} poises. Both viscosimeters are provided with controlled atmosphere high-temperature furnaces to permit measurements in non-oxidizing atmospheres. In most cases, meaningful data could not be obtained over an intermediate range of temperature where crystallization takes place to a significant extent during the time required for accurate determination of the viscosity. The viscosity vs. temperature relations for these ranges are therefore estimated by interpolation between the higher temperature and lower temperature data. In all cases, the measurements were made on synthetic compositions, prepared by melting in molybdenum crucibles at high temperatures in a reducing atmosphere.

The results of the viscosity measurements are compared with predictions based on the model of Battinga and Weill for flow at relatively high temperatures. Useful agreement is found with the predictions of the model over the full temperature range where it is suggested to be applicable. The apparent activation energies for viscous flow in the various ranges of temperature are similar to those observed previously with terrestrial silicate liquids.

The viscosity data are also used to clarify the glass-forming characteristics and crystallization behavior of the two compositions. In this clarification, use is made of the growth rate data determined in a companion study. These data were obtained on synthetic materials prepared and tested under identical conditions to those used in the present investigation.