Structural Water in Volcanic Glass

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Abstract: High-resolution transmission electron microscopy has revealed spherical and hemispherical structures on the surface of partly hydrated volcanic and synthetic glasses. These structures contrast with the bulk of the glass in showing lattice-fringe images indicative of the early stages of crystallization. Heavy-ion Rutherford scattering analysis of the noncrystalline volcanic glass indicates a structural water with hydrogen and deuterium. Depth profiles show that the glass grains contain structural water without adsorbed water on the surface. The presence of structural water in volcanic glass must be of interest to the formation of primitive clays. The spherical and hemispherical structures favor production of clay precursors in the presence of water.

Key Words: Glass • Heavy-ion Rutherford scattering • High-resolution transmission electron microscopy • Structural water

Clays and Clay Minerals; February 1992 v. 40; no. 1; p. 122-127; DOI: 10.1346/CCMN.1992.0400113

Clay Minerals Society (www.clays.org)