

Geochemistry of reversible hydratable tephra from the Trans Mexican Volcanic Belt

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ABSTRACT

Rhyolitic glass of high, reversible adsorption water (to 12.63 wt%) occurs in pyroclastic rocks from the La Malinche stratovolcano in the Mexican Volcanic Belt. The glass constitutes 98 vol% of the pyroclastics. It is a heterogeneous glass that dehydrates reversibly at 72 °C, composed of sodic and non-sodic glasses of surface activity caused by ^{IV}Al substituting in Q⁴(1Al) and Q⁴(2Al) positions, minor ^VAl, tetrahedra terminating in NBOs, and insufficient Na and Ca to charge balance Al in the glass network. Adsorption is of molecular water H₂O_m in interstitial sites, H-bonded to silanol groups, to the silica network, and to other H₂O_m molecules. Sodic glasses contain 71.80–77.77 wt% SiO₂, are partially devitrified to crystallites (~5 nm size) of Na-plagioclase and clinopyroxene, and exhibit minor low-grade metamorphism to <1 vol% crystals of mazzite (~10 μm size). Sodium-free glasses are more siliceous, with 74.84–83.88 wt% SiO₂, show partial devitrification to crystallites (~5 nm size) of Ca-plagioclase and clinopyroxene, with minor low-grade metamorphism of glass and plagioclase to <1 vol% crystals of laumontite (~10 μm size).

Keywords: Hydratable glass, hydratable rhyolite glass, hydratable tephra, Malinche tephra, Mexican Volcanic Belt