

Post-eruption chlorine-rich phase formation in the Campanian Ignimbrite, southern Italy

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The trachyte-phonolite Campanian ignimbrite erupted at 39 ka [1] with an estimated volume > 200 km³. The Cl-bearing marialitic scapolite (4.1 wt% Cl), cancrinite (8 wt% Cl), sodalite (7.2 wt% Cl), halite, and sylvite have been identified in massive yellow and gray facies ignimbrite and in the welded proximal facies called 'piperno'. Textures, fluid and solid inclusions, and crystal habit, indicate that these minerals formed post-emplacement from hot aqueous fluids. Cooling, fluid migration, and perhaps post-emplacement fluid exsolution mobilized sufficient material from the erupted mass to form a variety of Cl-rich phases, alter glass, and to form overgrowths on alkali feldspar. Some of these Cl-bearing phases are partially altered. Cl-rich scapolite has been reported [2] from fumarolic mounds in the Bishop tuff, erupted at 759 ka. and we find Cl-rich scapolite in lithophyse and along cracks in the Tshirege Member, Upper Bandelier Tuff (1.2 Ma.). We do not know of any occurrences in older volcanics. We suggest that given enough time, these Cl-rich phases will alter, releasing Cl to the groundwater via water-rock interaction. Hence, the chemistry of the bulk ignimbrite will, in time, become Cl depleted. This suggests that comparison of Cl concentrations in early pristine silicate-melt inclusions (~ initial Cl concentration) to the bulk chemistry of the erupted products (~ final Cl concentration) in older deposits may assume a greater atmospheric Cl emission than had actually happened.

[1] De Vivo *et al* (2001) *Min & Pet* **73**, 47-65 [2] Sheridan (1970) *Bull. GSA* **81**, 851-868