

## **CHEMICAL VARIATION IN NATURAL VOLCANIC TITANITE**

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Titanite is a common accessory phase in plutonic and metamorphic rocks, but has been reported to be uncommon in volcanic rocks. This appears to be true for many volcanic suites, however, in some, titanite is quite common. We have examined from the western United States the mineralogy of over 150 airfall ash beds from the Middle Jurassic, Late Jurassic, and Late Cretaceous and about 120 Tertiary ash flow tuffs and lavas. All are related to subduction of oceanic lithosphere beneath North America. Titanite occurs in about 50% of Middle Jurassic ash beds and 53% of Late Jurassic ash beds. However, less than 7% of Late Cretaceous and Tertiary ashes contain titanite. This difference may be related to the oxidation state and the amount of crustal contamination present in the source regions.

Volcanic titanite most commonly occurs in oxidized calc-alkaline dacitic to rhyolitic rocks, but may also be found in andesites and in alkalic rocks over a wide range of SiO<sub>2</sub> concentrations. In calc-alkaline rocks, titanite generally increases in content of LREEs, Y, and Mn and decreases in Ca and Ti progressively from andesite to dacite to rhyolite, mimicking the changes in bulk rock chemistry.

When comparing rocks of similar composition, titanites from Middle and Late Jurassic ash beds have significantly higher levels of Mn and Y, but not of LREEs. These elevated levels do not appear to be related to secondary alteration of the titanite, but reflect shifts in chemistry due to enhanced magmatic evolution or variations in magma source.