

## Overlapping Cretaceous and Eocene Alteration, Twin Creeks Carlin-Type Deposit, Nevada

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### Abstract

We report here new Ar-Ar dates for adularia, illite, and muscovite from the Twin Creeks Carlin-type deposit. All illite samples were obtained from altered intrusive and volcanic rocks that are interlayered with mineralized sedimentary rocks, thus largely avoiding complications caused by detrital illite and muscovite in sedimentary rocks. Interpretation of the illite-age spectra was based, in part, on newly developed models for the behavior of argon in fine-grained illite. The results indicate that all adularia (in the Megapit area) formed at about 42 Ma (Eocene), whereas most illite in the Megapit area and muscovite in alteration zones beneath Chimney Creek formed at about 109 to 103 Ma (Cretaceous). Additional events involving formation of illite at 200 Ma and muscovite at about 310 Ma were also observed but were not widespread enough to be considered significant. Our Eocene date for adularia is in complete agreement with previous measurements on adularia from Twin Creeks, but our Cretaceous dates are considerably older than dates determined in previous studies of the nearby Getchell district, particularly the Osgood stock, which has a date of 98 to 92 Ma. Our results suggest that the Osgood stock is part of a more protracted Cretaceous igneous-hydrothermal event that took place between about 109 and 83 Ma. The relationship of adularia and illite to gold mineralization is not completely clear, making it impossible to use our data to assign a unique age to the Twin Creeks deposit. We favor an Eocene age for some gold mineralization because the adularia that we dated is intimately intergrown with auriferous, arsenian pyrite typical of Carlin-type mineralization. However, adularia has a very restricted distribution in the deposit and temperatures at which it formed were probably not great enough to reset Cretaceous and older ages of illite. Illite is much more widespread and its association with gold is supported by correlation between gold content and K/Al ratios of mineralized material. Thus, Cretaceous illitization was at least an important ground-preparing event at Twin Creeks, and it is not possible to show from our data that gold ore or protore were not deposited during this event.