

## **Elemental and stable isotope chemistry of cuttings and core samples from SAFOD drill hole**

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We have analyzed the major and minor element chemistry and stable isotope composition of samples from the SAFOD drill hole in order to document fluid-rock interactions in the San Andreas and associated fault zones. To date, we have analyzed samples from three sections of the drill hole that likely contain faults, indicated by changes in mineralogy, drilling breaks, and/or anomalous gas shows. The elemental chemistry of samples in the interval from 3185 to 3210 m (10450 to 10530 ft) measured depth (MD) does not vary significantly. From the top to the bottom of this interval, only magnesium, yttrium, and barium increase and calcium decreases moderately across this interval. The yttrium and barium variability is potentially due to variable contamination of barite-bearing mud in the cuttings. In the sample interval from 3310 to 3353 m (10860 to 11000 ft) MD, iron, magnesium, and potassium increase whereas calcium decreases moderately down hole. In sample interval 3475 to 3517 m (11400 to 11540 ft) MD, iron increases and calcium decreases slightly down hole. Other major and minor elements measured by the XRF analyses do not vary significantly across these three intervals. In general, the elemental variations observed in each interval correspond to mineralogical changes across the intervals. Carbon and oxygen isotope values of carbonate veins and breccias from the 3185 to 3210 m and 3475 to 3517 m intervals range from 0 to +8 per mil (carbon) and 14 to 20 per mil (oxygen), consistent with carbonate precipitation from fluids that had undergone isotopic exchange with silicates. More work is being done to elucidate the origin of the fluid and the extent of fluid-rock interactions in the fault zones.