

## Space Weathering on Asteroids: A Mechanism for Sulfur Depletion on Eros?

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### Abstract

The NEAR Shoemaker mission to asteroid Eros confirmed the chondritic nature of the surface except for the S/Si ratio. Eros appears to have major depletions in sulfur ( $S/Si = 0.05$ ) from at least the surface regolith in comparison to a typical CI chondrite ( $S/Si = 0.528$ ). Several mechanisms have been proposed to explain the sulfur depletion: partial melting, physical separation, and space weathering by hypervelocity impacts and solar wind effects. To date, space weathering has only been studied in any detail for lunar regolith. Given the recent data for Eros, it is now desirable to explore in depth how space weathering affects other solar system bodies such as asteroids. For this, meteorites will be used as representatives of asteroids. Troilite (FeS) is the most abundant S-bearing mineral in meteorites and presumably these meteorites have parent bodies of S(IV) asteroids such as Eros. The energy required to vaporize troilite is  $\sim 43 \text{ kJ/cm}^3$ , which is much lower than for most silicate minerals and significantly lower than for metallic iron. Thus, any mechanism that pumps energy into the surface will result in a preferential loss of FeS. Laboratory experiments simulating space weathering by solar wind sputtering on a chondritic asteroid are being performed using a  $\sim 2\text{kV}$  Ar plasma generated by a converted Hummer II sputtering unit. Preliminary results will be presented at the meeting.