**GEOCHEMICAL ANALYSIS OF A TYPE II FULGURITE**

M.L. Joseph, Z. Atlas, D. Royall, and M.A. Pasek. Department of Geology, 4202 E. Fowler Ave. SCA 528, University of South Florida, Tampa, FL 33620, mljosep2@mail.usf.edu.

Fulgurites are glasses, formed by cloud-to-ground lightning strikes. They are formed by the rapid transfer of 10-100 MJ over a narrow plasma channel with a width of ~1 cm. The energy density produced from fulgurite formation is similar to the energy density found in meteorite impact shock materials. It has been suggested that the geochemistry of fulgurites and meteorite impacts is similar [1]. Therefore, fulgurite formation can serve as a proxy for impact identification, shock isotropization, and selective mineral melting. In this study fulgurite bulk and trace elemental chemistry was analyzed to correlate metamorphism in fulgurite formation and meteorite impacts.

Type II [2] fulgurite samples from Greensboro County, NC, USA, were analyzed using Inductively Coupled Plasma (ICP) Optical Emission Spectoscopy, ICP-Mass Spectroscopy (ICP-MS), Laser Ablation ICP-MS, and Electron Probe Microanalysis (EPMA). The outer crust yields more volatile elements Ca, Na, Mn, and Mg; along with higher concentrations of Fe and Ti in the mineral forms $TiO_2$ and $FeTiO_3$. A "toasted" region is found at the glass-mineral transition boundary and has $SiO_2$-dominated glasses which retain some of the structural order of the parent grains, suggesting these grains may be diaplectic glasses [3]. Melting is complete inward of the "toasted" region and is well-mixed and volatile-depleted.

Melt verse crust ratios and condensation temperatures constrain refractory and volatile elements during metamorphism. Elements retained during fulgurite formation include: P, Fe, Si, Al, Ni, Mn, Co, Zr, and Hf. Elements lost during fulgurite formation include: Na, Mg, Zn, and Sn.

In addition, we present soil sample ICP-MS results to compare elemental abundances in the fulgurite. Since this fulgurite appears to have experienced shock pressures with peaks of 10-30 GPa, constraining the geochemical changes that took place during its formation may provide insight into changes that take place during hyper-velocity impact. Further research on the soils and fulgurites will constrain element behavior during high energy events.

**References:** [1] Sheffer, A.A. 2007. Dissertation, University of Arizona. [2] Pasek M. and Block K. 2009. *Nature Geoscience* 2:553-556. [3] Pasek M.A. et al. 2010. 73rd Annual Meeting of the Meteoritical Society. New York, NY.