

A Method For Delivering Prebiotic Molecules to a Planetary Surface: Results From Smashing Rock and Organics at 11.2 km/second

Deborah S. Bass; Southwest Research Institute
William M. Murphy; Southwest Research Institute
Gregory P. Miller; Southwest Research Institute
James D. Walker; Southwest Research Institute

It has been postulated that organic-rich planetesimals played a crucial role in the origin of life, but the mechanism by which the organics could have been delivered to a planetary surface is not well understood. We have developed a technique for launching aluminum projectiles at velocities above 11.0 km/s [1]. We fabricated a target that represented both the planet and the bolide. An inorganic, aluminum projectile impacted a layered target composed of aluminum and zeolitic tuff that was saturated with an aqueous solution containing dissolved deuterated naphthalene, a simple polycyclic aromatic hydrocarbon. Gas chromatography was used in conjunction with mass spectrometry on the tuff plugs as well as the gas retrieved from the inner chamber. Data were retrieved from 10 to 300 daltons. Preliminary results showed that deuterated products were found in the gas from the chamber, as well as in the tuff plugs. Naphthalene, benzene and toluene were identified in deuterated forms, although no compounds larger than naphthalene were found in the post-impact environment. Thin sections of tuff were acquired from each layer of the target and from the control samples that were unimpacted tuff. Thin section analysis of post-impact material showed a high degree of mechanical deformation varying with depth in the target, but no indication of high-pressure phases or recrystallization. There did not appear to be a substantial difference in fracture patterns between tuff plugs within a single layer.

[1] Walker J. D. *et al.* (1993) *Int. J. Impact Engng.* **14**, 763-774.