SURVIVABILITY OF RNA AND PROTEIN MONOMERS AGAINST EFFECTS OF SHOCK PRESSURES. G. Ertem and G. Cooper[2],
[1] Department of Atmospheric and Oceanic Science, 4110 Computer and Space Sciences Building, College Park, MD 20742
[2]Space Science Division, NASA Ames Research Center, Moffett Field, CA, 94035

Introduction: As was reported in detail in several publications, organic compounds are delivered to Earth, and Martian soil from space via meteorites [1, 2, 3, 4], comets [5], and interplanetary dust particles [6, 7] with an estimated amount of 2.4×10^8 g of organic carbon/year [7], [8], [9].

A large number of organic compounds that are known as the building blocks of life, namely monomers of ribonucleic acids (RNA) and proteins, have been identified in meteorites: Examples are: amino acids [10], pyrimidines [11], purines [12), sugar acids [13].

We have been investigating the survivability and fate of building blocks of RNA and proteins mixed with Martian analogue soils and minerals subjected to increasing shock pressures mimicking the asteroid impacts.

Our work studying the effects of UV and gamma radiation will be presented in another talk [14].

It has been reported that amino acids and a peptide mixed with saponite, a clay mineral with layer structure, were subjected to 12-28.9 GPa shock pressures, which translate into 2.4-5.8 km/s for silicate-silicate impacts on Earth [15]. Amino acid degradation increased with the impact pressures. Cooper et al studied the survivability of sulfonic acid and phosphonic acid derivatives embedded in a meteorite matrix against the increasing shock pressures up to 42.9 GPa [16], which translates into natural silicate-silicate impacts at velocities of approximately 6 km/sec. This velocity range may well represent the impacts that occurred during early solar system evolution as well as asteroid impacts at oblique angles on most planetary surfaces.

Experimental. Here, we report the results obtained by subjecting the building blocks of RNA (RiboNucleicAcids) and proteins mixed with Martian analogue soils and minerals to increasing shock pressures of 10, 25 and 40 Giga Pascal mimicking the asteroid impacts.

Sample preparation and shock procedure. Mineral-organic mixures were freeze-dried and subjected to shock impacts at NASA's Johnson Space Center with a Tungsten target assembly and stainless steel flyer. The impact speed was 1.364-1.379 km/s corresponding to 39.5-40.0 GPa (1 Gigapascal = 10 kilobars). *Analysis of organics extracted from minerals:* 5'-adenosine monophosphate and 5'-cytidine monophosphate, 5'-AMP and 5'-CMP, respectively, were analyzed by high performance liquid chromatography, HPLC [16]. D,L-alanine was analyzed by gas chromatography-mass spectrometry, GC-MS [17]. Results demonstrated that only 4.3% of organics survived at the 10.5 GPa, while they were all completely destroyed at shock pressures of 40 GPa.

Organic	Shock stress		
Compound	10.5GPa	28GPa	40GPa
5'-AMP	4.30	0.67	0
5'-CMP	4.30	0.71	0

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