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Signature of impact-produced organic molecules in Luna 16 regolyth samples.

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Organic molecules can be produced by various natural processes and can be found in interstellar clouds, meteorites, comets, planets, etc. A hypervelocity impact of a meteorite is generally considered as destructive process for organics because of the action of two factors: 1) extremely high temperatures, and 2) oxidizing conditions in the forming plume due to thermal dissociation of silicates. Luna 16 regolyth contain a layer which has a noticeable enrichment in volatile elements (including carbon) which is considered as a signature of an impact of a comet or carbonaceous meteorite [1]. The present paper considers the possibility of synthesis of organic species from initially inorganic carbon and hydrogen during simulated impact-induced vaporization of silicates in relation to the observed lunar regolyth organics.

Our simulation experiments were performed using standard laser pulse (LP) technique [2]. Experiments show a rather efficient synthesis of complex organic molecules even at oxidizing conditions. The earlier experiments have shown a rather efficient synthesis of volatile organic molecules during simulated impact-induced vaporization of various silicates [3]. The formation of nonvolatile organic components in such processes was indicated by the presence of carbon with C-C and C-H bonding during investigation of the forming condensates by methods of X-ray-photoelectron-spectroscopy (XPS) [4].

The amount of formed organic species is orders of magnitude higher than gas phase thermodynamic equilibrium [5]. We claim for heterogeneous catalysis on the surface of siliceous nano-particles which are condensing everywhere in the spreading cloud.

Organic materials were mainly highly polymerized oxygen containing molecules which have low solubility in solvents. Lunar 16 and experimentally produced organics have high compositional similarity.

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