

Experimental study of powdered and solid andesite properties at low impact loading conditions

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The shock properties of the lunar regolith analog are studied by the VISAR laser interferometry in the range of impact velocities from 250 to 800 m/s. The samples are made of powdered and solid andesite. Two types of powdered andesite are studied: (i) with particle sizes from 10 to 200 μm , average particle size of 80–90 μm and initial density of 1.34 g/cm³ and (ii) with particle sizes from several hundred nanometers to 400 μm and initial density of 1.16 g/cm³. The data obtained covers a region of impact velocities in which no previous studies have been conducted. At a shock compression pressure of 1.9 GPa, the elastic precursor was found in solid andesite. In the particle velocity – shock wave velocity plane, the Hugoniot of powdered andesite lie below the Hugoniot of the solid andesite, which is primarily due to the absorption of impact energy during pore closure. At the same time, the Hugoniot of powdered andesite with narrower particle size distribution and higher bulk density lies above that of powdered andesite of the second type, which is consistent with the known data on porous media.