

1 Alloys formation upon hypervelocity impacts

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Satellite materials exposed to the space environment are indeed valuable detectors for cosmic and man-made solid particles. Many investigations have been made to deduce the geometric (size, shape) and dynamic (incidence angle) parameters of these projectiles from the morphology of the impact features. Furthermore the chemical analysis of remnants (when they are found) inside craters can provide valuable information about the nature and the origin of these particles. However, interpretation difficulties have made necessary laboratory hypervelocity impact tests. A number of impacts with well defined angles of incidence and velocities using calibrated projectiles have been performed on various targets. Alloys obviously formed from projectile and targets components are found. We have studied the links between the morphologies, the physical and chemical properties of these alloys and those of the incident particles and the targets. When projectiles and targets are made of pure materials, such as in laboratory tests, we have found a clear connection between the composition of the alloys and the kinetic energy of the projectiles. Explanations using phase diagrams are given. An extrapolation to complex materials such as those used in solar arrays is presented. Further modelling of the alloys formation upon hypervelocity impacts is proposed.