Abstract Submitted
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Interrogating heterogeneous compaction of meteoritic material at the mesoscale using analog experiments and numerical models[1] JAMES DERRICK, MICHAEL RUTHERFORD, THOMAS DAVISON, DAVID CHAPMAN, DANIEL EAKINS, GARETH COLLINS, Imperial College London — Chondritic meteorites were lithified during solar system formation by compaction of bimodal mixtures of mm-scale, spherical, solidified melt droplets (chondrules) surrounded by a porous matrix of much finer grained dust. A possible compaction mechanism is low-velocity planetesimal collisions, which were common in the early solar system. Mesoscale numerical simulations of such impacts indicate heterogeneous compaction, with large porosity and temperature variations over sub-mm scales in the matrix and chondrules largely unaffected. In particular, compaction and heating are enhanced in front of the chondrule and suppressed in its wake. Such observations may provide a new tool for interpreting evidence for impact in meteorites. Here we present impact experiments that replicate compaction surrounding an individual chondrule using analog materials: Soda Lime glass beads/rods and 70% porous silica powder matrix (Sipernat). Real-time, X-ray imaging of the experiments, combined with mesoscale modelling, provides experimental confirmation of anisotropic matrix compaction surrounding individual chondrules, aligned with the shock direction.

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