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Influence of nano-size inclusions on spall fracture of copper single crystals SERGEY RAZORENOV, Institute of Problems of Chemical Physics RAS, GENNADY KANEL, Joint Institute for High Temperatures, GALINA IVANCHIKHINA, Institute of Problems of Chemical Physics RAS, INSTITUTE OF PROBLEMS OF CHEMICAL PHYSICS RAS TEAM, JOINT INSTITUTE FOR HIGH TEMPERATURES TEAM — Spall experiments have been carried out for copper in different structural states. The samples were copper single crystals, crystals of Cu + 0.1% Si, copper crystals with silica particles of 180 nm average size, and polycrystalline copper. Shock pulses of 10^{-8} s to 10^{-7} s duration were generated by aluminum flyer plates 0.1 mm to 0.8 mm in thickness at 0.6 km/s to 1.2 km/s impact velocity. In experiments, the free surface velocity histories were recorded with the VISAR. Solid solution Cu + 0.1% Si demonstrates more prolonged spall process than pure copper crystals. At longer pulse durations its spall strength is slightly less than that of pure crystals but approaches the latter with decreasing pulse duration. Fracture of copper with silica inclusions is completed much faster. The spall strength of this material is close to that of Cu + 0.1% Si crystals and approaches the strength of polycrystalline copper with decreasing the load duration. Mechanisms and kinetics of the spall fracture process are discussed in the light of these new data. The work was supported by Russian Foundation for Basic Research, grant number 06-02-17057-a.

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