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Comparison between experiments and molecular dynamic simulations of spallation induced by ultra-short laser shock on micrometric Tantalum targets JEAN-PAUL CUQ-LELANDAIS, MICHEL BOUSTIE, LAURENT SOULARD, LAURENT BERTHE, ARNAUD SOLLIER, JOELLE BONTAZ-CARION, PATRICK COMBIS, THIBAUT DE RESSEGUIER, EMILIEN LESCOUTE, LCD-CNRS (UPR 9028) — Shock wave propagation and the spallation within materials induced by laser shock have been investigated for roughly two decades. With the latest laser technologies evolution, one can access to shorter regimes in durations, going below the picosecond range. Shots performed with the LULI 100TW facility evidence the possibility to obtain spallation in a few microns thick metallic target. Such conditions provide an experimental data layout directly comparable with molecular dynamic simulations accessible to these scales. Molecular dynamic simulations on a single crystal of Tantalum have been performed with the CEA TERA 10 computer. First, the Hugoniot calculated by the equilibrium molecular dynamics has been compared with experimental data to check the potential (EAM) relevance to reproduce the shock wave propagation. Then, a large scale simulation on a micrometric target has been performed. We have observed the microscopic ductile damage process, the pore apparition and their time and space evolution. The results are compared with experimental results and classical one-dimensional hydrodynamic simulations.

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