# Multiple Spalls in Copper Under Sliding Loading

**Sokolov M A[@], Dolgikh S M, Smirnov V N, Kiskin P E, Petrovcev A V and Shatov M M**

Federal State Unitary Enterprise "Russian Federal Nuclear Center—Academician Zababakhin All-Russian Research Institute of Technical Physics", Vasilieva 13, Snezhinsk, Chelyabinsk Region 456770, Russia

[@] sokolovm1982@mail.ru

The paper discusses the experimental and computational results of spall processes in M1 copper. The samples were disks 120 mm in diameter and 10 mm thick. HE layers 3 mm thick were placed on both sides of the disks. HE used in the experiment was plasticized hexogen with density of 1.6 g/cm$^3$, detonation velocity of 8.4 mm/s, pressure at the Jouget point of 28 GPa. HE with similar characteristics (detonation velocity of 7.6 mm/s) was used in the calculations. The sliding detonation created the symmetrical loading in the sample in the form of undamped oblique waves. The wave amplitude was 23 GPa, and the inclination angle was 40. The principle of two-in-one experiment was implemented due to symmetry. The experimental diagnostics was performed using pulsed radiography and visualization of the elements recovered after the experiments. In the experiments and calculations the sample was split into five layers: two layers on each side one central layer. The thicknesses of the external spall layers were 3 mm and 3.2 mm, including one-sided roughness within 1.3... 1.4 mm. The thicknesses of the subsequent spall layers were 4.55 mm and 4.75 mm with two-sided roughness within 1.0... 1.2 mm for each side. The "spall" roughness increases with approaching to the symmetry plane. It is no coincidence that the central layer 1 mm thick had through holes and was similar to a colander. The roughness increase with depth is identical to the increase in the incident rarefaction wave width. Consequently, failure begins in the external layers of the sample under the interaction of two release waves from detonation products and an incident wave in copper.