N1-P-021004

MICROHARDNESS OF A DEFORMED COPPER SAMPLE WHEN IMPACTED ON A RIGID WALL

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One of the widely used method for evaluating the dynamic characteristics of metals and alloys is the Taylor impact test. This method relates the dynamic yield strength of a cylindrical sample material to its residual length after impact on a non-deformable target. Taylor impact test is commonly used to determine the yield strength [1-3] and select constitutive relations and constants in numerical simulations [2-4].

This paper presents the Taylor impact test conducted using a one-stage light-gas gun [5]. A copper cylinder (M1) with a length of 32 mm and a diameter of 7.8 mm was used as a sample. The mass of the sample was about 15 g. Throwing conditions were chosen to ensure that the velocity of the sample exiting the barrel ranged from 150 to 450 m/s. Samples after testing were cut into two parts along the axis of symmetry using a DK7732 CNC EDM Wire Cutting Machine. Microhardness of samples was determined on a PTM-3 hardness tester (GOST 9650-76) with a measurements error of 2%.

Figure 1 shows the microhardness measurements along the symmetry axis of a copper sample at different impact velocities.

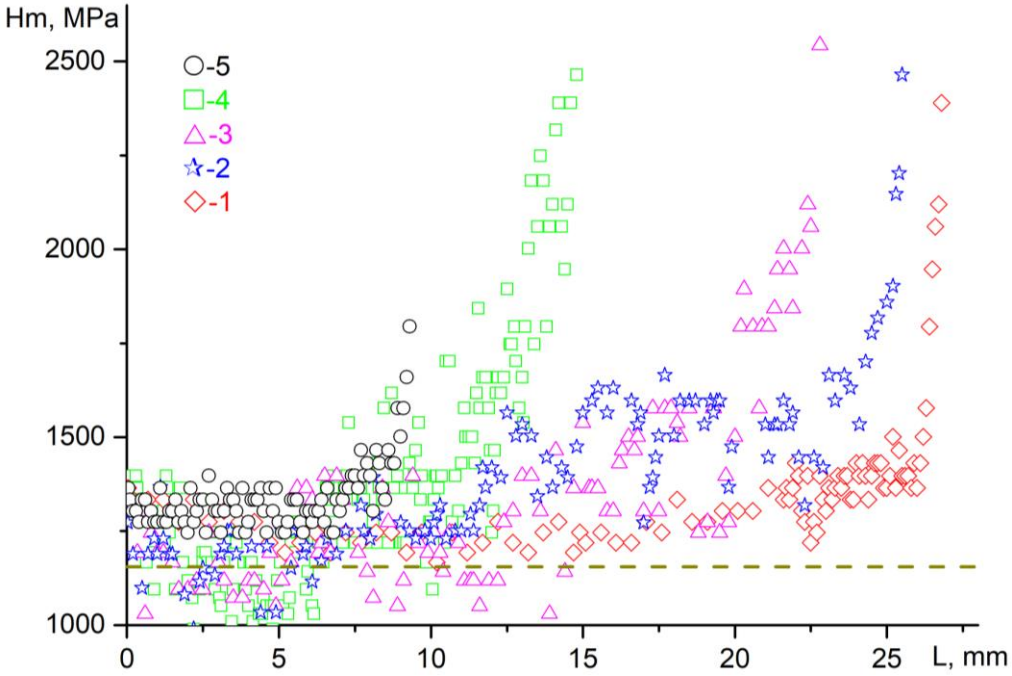

Fig.1. Distribution of microhardness along the axis of the samples at different impact velocities: (1) 162 m/s, (2) 167 m/s, (3) 225 m/s, (4) 316 m/s, (5) 416 m/s.

Non-linear changes in microhardness are observed along the sample axis after impact on the non-deformable target. For the starting sample, the average value of microhardness is 1155 MPa (Fig. 1, dashed line). The results in Fig. 1 show the higher microhardness at most points in the deformed state compared with the initial state.

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