Investigation into dynamic deformation of cooper and its alloys using composite Hopkinson bars


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The problem of strength and fracture under single loading (such as shock, explosion etc) is particular importance in terms of materials and structures dynamic loading problem. High deformation or loading rates, high stress levels, big plastic deformations as a result of mostly adiabatic deformation process, and specific material response under such loading make it a challenging task to provide background for the development of matter deformation and fracture math models used for the purposes of structural elements properties calculation. Reliability and comparability of the investigation results primarily depend on scientific justification of high-velocity experiments setup. The method of composite Hopkinson bars (CHB), also known as Kolsky method, is one of the methods, having clear theoretical background, high efficiency, flexibility, and reliability of the results. This method allows us to study dynamic stress-strain diagrams at deformations rates $E = 10^2–10^4$ s$^{-1}$. In the work, we present the results of the experiments where we dynamically compressed copper and copper–tin alloy using CHB method. We determined Dynamic compression diagrams. We also determined Johnson–Cook parameters for copper and copper alloy, this from is widely used in dynamic calculations.