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The Influence of Grain-size on Dynamic Shear Localization in Thick Walled Copper Cylinders ZEV LOVINGER, ZVI ROZENBERG, RAFAEL, DANIEL RITTEL, Technion - Israel Institute of Technology — Thick-Walled Cylinder collapse experiments were carried out on copper specimens to explore the influence of grain size on their spontaneous dynamic shear localization behavior. Average grain sizes of 20, 75, 200, and 300 μm, were achieved by means of heat treatments. Measuring the stress strain curve for the different coppers on the Kolsky-Bar apparatus showed no significant differences between the strength of these materials. This enabled us to pinpoint the microstructural influence on shear localization, excluding the possible effect of strength differences between the specimens. Experiments were conducted on a pulsed current generator using magnetic pressure as the driving force. Large plastic strains, of up to 1, were reached, for which preliminary results show the formation of intense twinning together with faint signs of localized shear bands in both fine and coarse grained specimens. We found at the inner surface of the specimens, where shear strains are the highest, a substantial layer of very fine grains followed by a layer with a very high density of twins. The weak appearance of shear bands in our copper specimens might be attributed to this fine grained layer, where shear bands initiate in this geometry, which we have not seen in other materials we tested such as Ti, Ti64 or stainless steel.

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