

Abstract Submitted
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On the anomalous grain size dependence of spall strength JUSTIN WILKERSON, University of Texas at San Antonio, KT RAMESH, Johns Hopkins University — Experimental studies have identified an anomalous grain size dependence of spall strength in a few face-centered cubic metals. Here we derive the first quantitative theory capable of explaining this phenomena. The theory agrees well with experimental measurements and atomistic calculations over a very wide range of conditions. Utilizing this theory, we are able to map out three distinct regimes in which spall strength (i) increases with decreasing grain size in accordance with conventional wisdom, (ii) non-intuitively decreases with decreasing grain size, and (iii) is independent of grain size. The theory also predicts microscopic characteristics of the spall fracture surface, which agree with available data.

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