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Fracture of severely plastically deformed Ta and Nb

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Abstract

A comparative study focusing on the fracture characteristics of severely plastically deformed (SPD) Nb and Ta is presented. Since many SPD-processes lead to typically elongated microstructures, orientation dependent fracture toughness measurements with three different crack orientations were performed. Among the various testing orientations, two exhibit a considerably high fracture toughness in both materials. The high fracture resistance in these orientations will be discussed on the basis of the significance of crack deflection and delamination processes. In both materials the lowest fracture toughness was found in the third testing orientation parallel to the grain elongation. However, between Nb and Ta the fracture toughness differs in this orientation by a factor of three, rendering Nb even parallel to the grain alignment to a quite fracture resistant material.

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