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Brittle Fracture of Iridium. How this Plastic Metal Cleaves?

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Abstract. The refractory platinum group metal iridium is the unique material, insomuch as it exhibits simultaneously two controversial mechanical properties such as the high plasticity and the inclination to the brittle transcrystalline fracture. Although iridium has the face-centered cubic lattice, it meets some empirical cleavage criteria despite considerable plasticity. This is the so called "iridium problem" and it is not solved until now. The review is aimed to the discussion of the experimental data concerning the deformation behavior of iridium and the crack growth in iridium single crystals on the microscopic (in the single crystalline samples stretched on air) and nano- (in the thin foils for transmission electron microscopy) levels. It is shown that cracks in iridium thin foils grow like a crack in such ductile metals as aluminum, copper, and nickel. Cracks in the bulk iridium single crystals behave like either a brittle trancrystalline crack, when the resource of crystal plasticity has been exhausted, or a notch in ductile metal, when the plastic deformation of the sample is possible.

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