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SIZE DEPENDENT DEFORMATION OF BETA BRASS

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Previous research has shown that size scale dictates materials strength, reaching into the GPa range for specimens in the (sub-) micron regime. However, the influence of crystal structure on this ‘size-effect’ is poorly understood. In the present work, the deformation behavior of beta brass, which has a CsCl (B2) crystal structure and a low thermal component to the room temperature strength, has been studied through the compression of focused ion beam manufactured pillars at room temperature. The size dependence of beta brass is found to be close to that observed in FCC metals although the deformation processes differ significantly. While its dislocation behavior resembles that of FCC metals, its slip behavior is typical of BCC metals. Furthermore, the crystal orientation dependence of the yield strength shows a shift as sample size decreases. These findings are discussed in the context of the mobility of screw dislocations as well as surface dislocation nucleation, which might promote such a change in orientation dependence.