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# Crystal plasticity finite element simulation on Mg-10Gd cylinder bar with texture gradient

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## Abstract

In this study, a cylindrical Mg-10Gd sample with a diameter of 6 mm designed for vascular stents was investigated. According to EBSD scans, the as-received microstructure exhibited a texture gradient from the specimen center towards the external surface. Stents are loaded along the hoop direction during crimping and expansion. Therefore, to simulate the in-service performance of the stent in finite element simulations using a conventional phenomenological constitutive model, calibration tests data along the hoop direction are required. However, obtaining such data for the current Mg-10Gd cylinder using a standard tension or compression test is nearly impossible owing to the small diameter and the texture gradient. As an alternative approach, this study employed a crystal plasticity finite element method (CP-FEM) to assess the mechanical behavior of the cylindrical Mg-10Gd sample along the hoop direction. The experimental and model-predicted force vs. displacement curves resulting from bending tests were compared. The result implies that the chosen CP-FEM model can reproduce the experimental data when accounting for the texture gradient.

**Keywords:** crystal plasticity, magnesium, texture gradient, anisotropy, extrusion, FEM

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