Calibration of Barlat Yld2004-18P Yield Function Using CPFEM and 3D RVE for the Simulation of Single Point Incremental Forming (SPIF) of 7075-O Aluminum Sheet

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Highlights

- Virtual experiments were performed using three dimensional (3D) representative volume elements (RVEs) created from Electron Backscattered Diffraction (EBSD) images. By applying the crystal plasticity (CP) material model to these 3D RVEs, it was possible to generate out-of-plane stresses required for the calibration of the Yld2004-18p yield function.
- Given the significance of through-the-thickness shear in SPIF, and that aluminum 7075 is anisotropic, Yld2004-18p was used as a non-quadratic anisotropic 3D yield function for the finite element simulation of incremental sheet forming. Anisotropy behavior of this alloy was characterized using Yld2004-18p and also Hill's 1948
- Yld2004-18p and Hill's 1948 were used to simulate the single point incremental forming (SPIF) of 7075-O aluminum alloy sheet. A detailed comparison of the two yield functions' predictions were made with respect to different parameters.