

PROCEEDINGS

Effects of Pre-straining on Material Anisotropy in Sheet Metals

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ABSTRACT

The material anisotropy of an aluminum sheet alloy is determined by performing tensile tests at different angles with respect to the rolling direction (RD). To study the effect of pre-straining on the evolution of material anisotropy, a very wide sheet is stretched to different strains in the transverse direction (TD). The material in the central region is very close to a state of in-plane plane strain tension. Small tensile samples are cut from the central region of the pre-strained wide sample. Tensile tests are then performed on these small tensile samples. By comparing the differences in the flow stress vs. orientation curves between the as-received and pre-strained sheets, the effect of pre-straining on material anisotropy is studied. Some surprising results are observed and emphasized. Based on both the experimental and numerical studies, it is suggested that the conventional methodology for determining material anisotropy would overestimate the pre-straining effect and would result in a completely erroneous yield surface.

KEYWORDS

Anisotropy; mechanical test; crystal plasticity; yield function

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