

Effects of Grain Shape and Crystallographic Texture on Plastic Anisotropy of Aluminum Alloy

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Abstract

Man has recently derived a formula on the q -value^[1] of orthorhombic sheets of cubic metals, which quantifies the effect of crystallographic texture on angular dependence of q -value. In this paper Man's formula is extended to one that accounts also for the influence of grain shape, which is here described by the "Microstructural Anisotropy Tensor" or a truncated expansion of the mean linear intercept function in spherical harmonics. Whereas the material parameters in Man's original formula assume very different values for an AA 5754 hot band and its O-temper counterpart in a previous study^[2], they are found to have much closer values under the new formula. This finding suggests that grain shape could play a significant role in the q -value anisotropy of aluminum alloys. Results of grain shape measurement on the O-temper material further corroborate the new formula.

Keywords: Plastic anisotropy; Crystallographic Texture; Grain shape

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