Variant Selection by Double Burgers Orientation Relation in Hexagonal Metals and Its Effects on Transformation Textures

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Abstract

Double Burgers orientation relation (DBOR) is a variant selection rule in which preferred variants hold Burgers orientation relation ({0001}hcp//{110}bcc and {11-20}hcp//{111}bcc) on both sides of a parent grain boundary when transformation between alpha (hcp) and beta (bcc) phases occurs by nucleation on parent grain boundaries. It has been well known for beta to alpha transformation. However, DBOR for alpha to beta transformation was not well recognized until very recently (1). The purpose of this contribution is to clarify how DBOR influences evolution of transformation textures in hexagonal metals such as Zr- and Ti-alloys in alpha-beta-alpha transformation. For instance, in a 2.5%Nb-Zr alloy the direction of (0001) in the initial alpha texture, which is oriented to the circumferential direction of a tube rotates by 90 degrees to the longitudinal direction during an alpha to beta to alpha transformation cycle. This texture change can be simply explained based on DBOR. Other similar cases for 6%Al-4%V-Ti as well as model fiber textures will also be discussed based on transformation texture prediction by DBOR. (1) T. Tomida, S. Vogel, Y. Onuki and S. Sato, Metals 2021, 11(10), 1653; https://doi.org/10.3390/met11101653.

Keywords: Variant selection, Transformation texture, Burgers orientation relation, DBOR, Pulsed neutron diffraction

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