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论文

电工钢中黄铜织构行为及其对Goss织构的影响

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摘要： 本文通过EBSD取向成像技术检测追踪了取向硅钢热轧、脱碳退火及二次再结晶过程中黄铜取向晶粒的形成规律. 结果表明, 黄铜取向的形成是热轧时Goss取向在剪切力作用下向铜型取向转动受阻而绕法向转动的结果. 与Goss晶粒和{111}<112>取向晶粒类似, 黄铜取向和 {111}<110>取向晶粒之间存在形变与再结晶相互转化的密切关系; 二次再结晶时若抑制剂钉扎控制不当, 在次表层的Goss晶粒快速长入中心层之前, 黄铜取向晶粒已长成大尺寸并接触样品表面, 随后的Goss大晶粒就很难吞并黄铜取向晶粒.

关键词： 取向硅钢 织构 热轧 二次再结晶 EBSD

BEHAVIORS OF BRASS TEXTURE AND ITS INFLUENCE ON GOSS TEXTURE IN GRAIN ORIENTED ELECTRICAL STEELS

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Abstract: In comparison with the conventional grain-oriented electrical steels (the so-called CGO steels), the high permeability electrical steels (the so-called Hi-B steels) including those of nitrided steels possess higher magnetic properties, but their processing window is narrow. In particular, a near brass--oriented texture which rotated around the normal direction of sheets from Goss orientation is often observed in improperly processed sheets of Hi-B steels, *i.e*, this type of sheet possesses a correct morphological structure of well abnormally grown grains, but a poor crystallographic texture with low magnetic properties. The underlying mechanism is less dealt with in literature in comparison with the formation of Goss texture. Thus, the objective of this work is to analyze the formation mechanism of this texture component. For this purpose, XRD and EBSD technique were applied to reveal both macro- and micro-textures from the shear texture of hot rolled plate surface to primarily and secondarily annealed sheets paying particular attention to the origin and relationship of Brass-oriented grains with their surrounding grains. It is demonstrated that Brass-oriented grains are formed by the rotation of Goss-oriented grains around the normal direction in the sheared surface layer of hot rolled plate when the shearing around transverse direction is restrained. Compared with the close relation between Goss and {111}<112> oriented grains, similar behaviors during cold rolling and annealing occur between brass-- and {111}<110>-oriented grains, namely, the latter are also inclined to be adjacently related and mutual transformation could occur between those deformation grains and recrystallization grains. In particular, a higher rolling reduction reduces Goss grain number much significantly, whereas it favors the retention of brass- and {111}<110>-oriented grains leading to preferred growth of brass-oriented grains. In the condition of easy growth of Brass grains with their {110} being parallel to rolling plane like Goss grains in the thinner sheets, the much fewer Goss grains could not swallow the brass-oriented grains. Thus, this technical issue of producing grain oriented electrical steels with high magnetic properties can be understood in terms of fundamentals of texture evolution during deformation and recrystallization of bcc metals.

Keywords: grain oriented electrical steel texture hot rolling secondary recrystallization EBSD

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