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Nong-Moon Hwang

Seoul National University, South Korea

Abnormal grain growth in Fe-3%Si steel

Abnormal grain growth (AGG), which is also called the secondary recrystallization, often takes place after primary recrystallization of deformed polycrystalline materials. A famous example is the evolution of the Goss texture after secondary recrystallization of Fe-3%Si steel. A selective AGG of Goss grains has remained a puzzle over 70 years in the metallurgy community since its first discovery by Goss in 1935. In an ambitious attempt to solve this puzzle, we suggested the sub-boundary enhanced solid-state wetting as a mechanism of selective AGG of Goss grains. According to this mechanism, if Goss grains have sub-boundaries of low energy, they have an exclusively high probability to grow by solid-state wetting compared with other grains without sub-boundaries. The existence of sub-boundaries in Goss grains was experimentally confirmed not only in our group but also in other groups. In order to understand why only Goss grains have sub-boundaries, the cold rolling process of the hot-rolled Fe-3%Si steel was analyzed by finite element method (FEM). The analysis showed that a small portion of Goss grains formed during hot rolling survives after cold rolling; the survived Goss grains have the lowest stored energy and are expected to undergo only recovery without recrystallization, producing sub-boundaries.

Biography

Nong-Moon Hwang has completed his PhD in Material Science and Engineering, Korea Advanced Institute of Science and Technology in 1986. He is a Professor in the Department of Material Science and Engineering, Seoul National University (SNU). From 1986, he worked in Korea Research Institute of Standards and Science until he joined the faculty in SNU in 2003. He has published more than 200 SCI papers and a former Director of Research Institute of Advanced Materials and a former Vice President of Korea Institute of Metals and Materials.

nmhwang@snu.ac.kr

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