

Abstract:

CHALLENGES OF MICROSTRUCTURAL CONTROL OF STEEL THROUGH DIFFUSION PROCESSES

The microstructure of steel grades determines most of their properties and can be influenced by diffusion processes, which may modify the chemical composition, microstructure and crystallographic micro texture of the materials. The paper concentrates on special steel grades developed for electrical applications (motors, transformers). Some of the considered aspects are related to the observation and control of order-disorder phenomena in Fe-Si-steels and their effect on mechanical and electrical behaviour. Specific diffusion-based manufacturing processes used to modify the microstructure and texture of electrical steel through processes including cladding, hot dipping, rolling and diffusion annealing treatments are discussed. Very specific diffusion profiles of Si and/or Al in the steel are obtained as a function of the processing parameters and substrate composition. Some thermodynamical and mathematical modelling elements are presented.