

Gas-Solid Nitrocarburizing of Steels: Kinetic Modelling and Experimental Validation

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Abstract : This study is devoted to defining the optimal conditions for the nitriding of pure iron at atmospheric pressure by using NH₃-Ar-C₃H₈ gas mixtures. After studying the mechanisms of phase formation and mass transfer at the gas-solid interface, a mathematical model is developed in order to predict the nitrogen transfer rate in the solid, the ϵ -carbonitride layer growth rate and the nitrogen and carbon concentration profiles. In order to validate the model and to show its possibilities, it is compared with thermogravimetric experiments, analyses and metallurgical observations (X-ray diffraction, optical microscopy and electron microprobe analysis). Results obtained allow us to demonstrate the sound correlation between the experimental results and the theoretical predictions.

Keywords : gaseous nitrocarburizing, kinetic model, diffusion, layer growth kinetic

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