

## ABSTRACT

### Low temperature nitriding of stainless steel

The monograph presents a complex analysis of phenomena occurring during low temperature (below 500°C) gas nitriding with ion sputtering used as an activating pre-treatment. The state-of-the art analysis is presented in the first part of the book, where current hypotheses concerning the composition and growth of nitrided layers composed of  $\gamma_N$  phase are discussed. The existing models of nitriding mainly concern plasma processes and they are critically analysed in chapter 2 on the basis of the author's own research into gas nitriding. It enabled the author to define her goals and draw an agenda of the research to be carried out. The goals are presented in chapter 3 together with the research plan. Chapter 4 presents the methodology to be used in the investigations, which includes studies on the parameters of ion treatment (type of sputtering gas used, current density and voltage) and gas nitriding processes (temperature and nitriding atmosphere composition).

The properties of microstructure and layers were also investigated and the results are presented in chapter 5. The influence of sputtering parameters on the microstructure of the nitrided layers is discussed. Moreover, the importance of crystallographic orientation of austenitic matrix for  $\gamma_N$  phase growth is analysed. The results were compared with those for ion nitriding already presented in literature. The effectiveness of ion sputtering is compared with other activation techniques. The influence of gas treatment parameters on phase composition as well as on the growth kinetics of the nitrided layers is evaluated. The main functional characteristic of the layers are measured (hardness, wear and corrosion resistance) and compared with layers nitrided above 500°C.

The discussion of the results presented in chapter 6 allows to formulate a new hypothesis concerning the mechanisms of the growth of nitrided layer on austenitic steel. Additionally, typical microstructures of nitrided layers are classified. Moreover, the aspects of practical applications of low temperature nitrided layers are presented together with technologically important parameters of nitriding process.

Die im Kapitel 6 dargestellte Analyse von Forschungsergebnissen erlaubt das Aufstellen einer Hypothese über den Wachstumsmechanismus der Nitrerschicht auf dem austenitischen Stahl während des Niedrigtemperaturnitrierens. Es wurden typische Nitrerschichten klassifiziert, die beim Nitrieren vom austenitischen Stahl erzielt werden. Darüber hinaus wurden praktische Aspekte der Ausnutzung des Niedrigtemperaturnitrierens beschrieben. Als wesentliche Grundparameter angegeben, die das Aussehen der Nitrerschicht und deren Gebrauchseigenschaften beeinflussen.