

Rutsarin Teerachavalkiat 2010: Kinetics of Boriding Process on Stainless Steels
AISI 304 AISI 420 and AISI 440C. Master of Engineering (Materials Engineering),
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The main objective of stainless steels is corrosion resistance. However, wear resistance is much more required due to complicated and high - load applications. Thermo - chemical surface treatments such as boriding process are frequently considered to enhance performance of stainless steels. The boriding process involves a diffusion process of active boron atoms into a substrate. A boride layer possesses many outstanding properties as compared to carburized or nitrided layers. Thus, in this research, the boride coating on stainless steels AISI 304 AISI 420 and AISI 440C have been investigated using a salt bath containing borax and ferro - silicon 15 % wt. as a reducer at ambient. The boriding processes were performed at temperature range of 1123 - 1273 K and for about 1 - 9 h. The boride layers were characterized intensively by optical microscopy, Scanning Electron Microscope (SEM) with Energy Dispersive X-ray Spectrometer (EDS) and X-ray diffraction (XRD). The thicknesses of boride layers were measured using the optical microscope with image analyzer program. The hardness values of the borided stainless steels AISI 304 AISI 420 and AISI 440C were measured by Vickers microhardness tester. It was found that near - surface hardness value of the borided layer of about 2000 HV was detected. Moreover, the boride layer thickness increase with increasing boriding temperature and time. The kinetics of the boriding process was analyzed by diffusion and Arrhenius equations. An activation energy of the boriding process on stainless steels AISI 304 AISI 420 and AISI 440C is of about 292.07 386.35 and 312.61 kJ/mol. Finally, a general equation using empirical parameters from experiment to predict the thickness of the boride layer was established for industries.

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