

Theerapa Supanaroj 2013: Effects of Distance between Cathode and Anode on Kinetics of Borided Hot Work Tool Steel AISI H13. Master of Engineering (Materials Engineering), Major Field: Materials Engineering, Department of Materials Engineering. Thesis Advisor: Mr. Patiphan Juijerm, Dr.-Ing. 82 pages.

Boriding is a thermochemical surface hardening process that can be increase the service life of parts. Pack boriding is one way that helps to surface treatment of parts but is high processing temperature and long process duration to lead a boriding case with an effective thickness. Therefore, it is a process with high cost. Direct current field (DCF) was employed in pack boriding which can be increased diffusion rate of boron atom. The factors that effected diffusion rate of boron atom in a direct current field is distance between the electrodes. The aim of this research was to investigate the effects of distance between cathode and anode on kinetics of borided hot work tool steel AISI H13. So, the hot work tool steel AISI H13 will be borided using pack boriding with and without direct current field (Current density =  $80 \text{ mA/cm}^2$ ) at temperature of  $850 - 950^\circ\text{C}$  for 2 - 6 h and distance between the electrodes 15 - 45 mm. Afterwards, microstructure and thickness value were investigated using optical microscope. Chemical compositions were investigated using X-ray diffraction. And the hardness of boride layer was measured by micro-vicker harness tester, respectively. It was found that a double phase (FeB and  $\text{Fe}_2\text{B}$ ) was detected on the boride layer. The near surface hardness value of about 1500 HV was measured. The boride layer has maximum thickness at the distance between the electrodes 15 mm and the activation energy was 140.33 kJ/mol which is less than the activation energy of pack boriding without direct current field was 185.71 kJ/mol.

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