

The Effect of Cooling Rate in Molten Salt Electro-Carburisation Process

ABSTRACT

In the recent development of a new process of electro-carburisation of mild steel in 800 °C molten carbonate based salts, further investigation has been carried out to study the effects of the cooling rate after the electro-carburisation process. In the process, the mild steel to be carburised was made the cathode and an inert SnO₂ as anode. Salt mixture of Na₂CO₃-NaCl (mole ratio 4:1) was used as the electrolyte, and the process was carried out at voltage range of 1.0 to 2.5 V for 60 min, and thereafter cooled at certain rate. As revealed by the optical microscopy, the microstructural changes in samples that have been electro-carburised and thereafter cooled either rapidly or naturally in air, were featured by the increase of the carbon rich at the expense of the original ferrite phase near the surface of the samples. Micro-hardness profiles measured from the surface to the centre of the electro-carburised sample presented clear evidence of carbon penetration as a function of the electrolysis voltage, and significant effects of cooling rate after the electro-carburisation process.