

Improving the Properties and Performance of Cathode Materials

Client: SEC Carbon Limited

Location: Auckland, New Zealand



The Project

High density pitch-impregnated cathode materials are used by various smelters to counter the trend of decreasing cell life due to line current increase. In this project SEC Carbon and LMRC studied the effect of pitch impregnation on cathode properties and performance.

LMRC's Role

The project involved two main investigations:

1. Characterising the pitch-impregnated phases and the other phases present in the cathode matrix. LMRC conducted microstructure characterisation using XRD analysis and ESEM analysis at room temperature and 800°C.
2. Determine the relative reactivity of these phases in a laboratory environment. The electrochemical wear rate (in cm/year) of the materials was measured using LMRC's laboratory scale electrolysis equipment. This testing method was developed by LMRC and the University of Auckland in order to determine the relative electrochemical reactivity of different cathode materials.

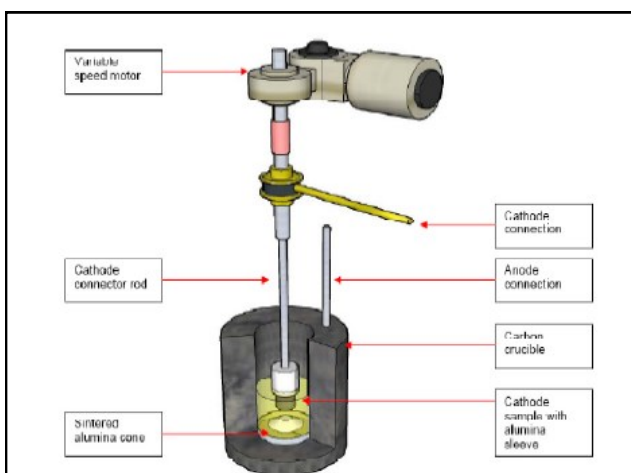


Figure 1: Experimental set up for laboratory electrolysis wear testing with rotating cathode

The Results

The microstructure analysis showed that graphitized impregnation pitch was found to have a higher degree of graphitization than graphitized binder pitch and also standard graphitized cathode block material.

The electrolysis results confirmed the theory that the graphitized impregnation pitch phase has a higher electrochemical reactivity than the graphitized binder pitch phase and also the graphitized coke phase

The results of this study helped SEC Carbon make critical decisions relating to it's product development pathway in regards to pitch-impregnated materials

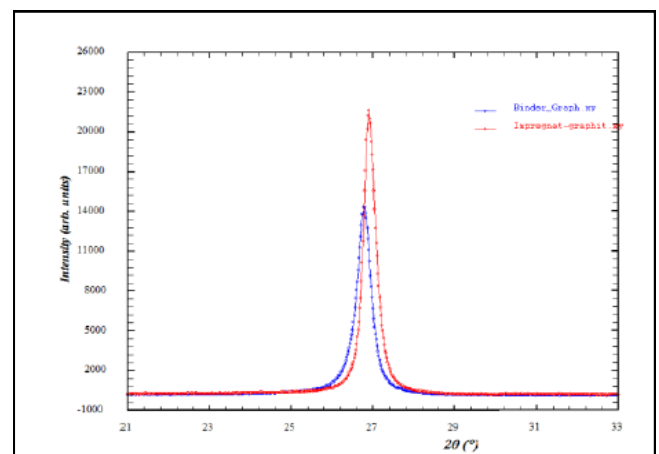


Figure 2: XRD pattern indicating the greatest degree of graphitization and crystallinity of the graphitized impregnation pitch compared to the graphitized binder .

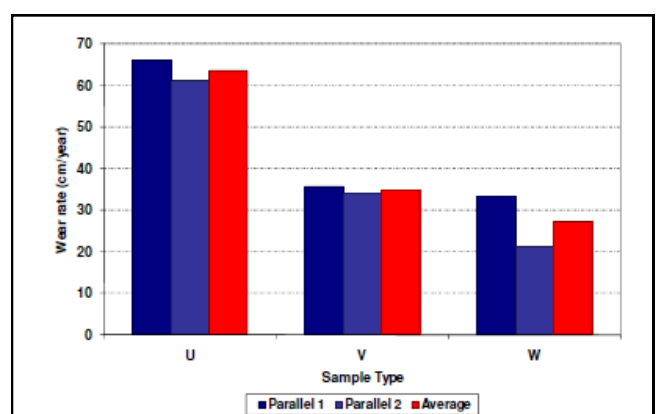


Figure 3: Erosion rates for samples U (60 wt% impregnation pitch rich), V (60 wt% binder pitch rich) and W (60 wt% powdered coke).



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