

Combinatorial PEM Fuel Cell Studies Of Binary Platinum Alloys

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The oxygen reduction catalytic activities of some binary platinum alloys have been measured by a number of research groups^{eg 1-4}. The results obtained suggest that for some alloys (eg Pt_xNi_{1-x} and Pt_xCo_{1-x}), the catalytic activity per unit mass of platinum passes through a maximum at intermediate alloying element content, giving rise to what is known as a volcano plot. The implications of this are that it is possible to replace some expensive platinum with a cheap metal such as Ni or Co with no loss and even some enhancement of the catalytic performance.

In this talk it will be shown how sputtering can be used to prepare films that cover the entire binary composition range. For this work, an array of compositionally varying “dots” are prepared using appropriate masks. This composition array is then tested in a 64-channel PEM fuel cell. This allows for the assessment of the volcano plot behaviour of the entire composition range for a binary alloy in one experiment under real-world fuel cell conditions.

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