BERKELEY CATALYSIS CENTER

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Combinatorial Methods for Catalysis, Fuel Cell and Electronic Materials

ABSTRACT

Combinatorial methods are now being widely spread to develop advanced functional materials for catalysis, fuel cell, polymers, electronic device, sensors and display. If there exists a huge experimental variable space, millions of samples should be rapidly prepared, characterized and evaluated to find the quantitative structure-activity relationship. Library work-up and library design should be done by data mining and artificial intelligence. Optical high-throughput-screening method was used to find novel anode (Pt77Ru17Mo4W2) and noble methanol-tolerant cathode (Pt50Ru10Fe20Se10) for direct methanol fuel cell. This method was also extended to determine the optimum gradient of the components for MEA (Membrane-Electrode-Assembly).

64-channel sequential/parallel fixed bed reactor system was developed and all the operations were computer-controlled. The error in the flow in each channel is ± 1.5 % and temperature distribution in each reactor is ± 1deg C. . Binary and tertiary Pt clusters containing Co and Fe were found to be highly active in SCR of NO.

The library of Bi4-xLaxTi3O12 ($0 \leq x \leq 1$) for FRAM capacitor was fabricated with multi-target sputtering system. The micro-beam XRD and Raman spectra of BLT library with 2 Pr measurement leads us to have useful QSAR within a short time.