



University of Hawai'i at Mānoa

## **Hawai'i Natural Energy Institute**

School of Ocean & Earth Science & Technology

# **Catalysts for Hydrogen Production from Methane; Design and Optimization of an MEA for a Direct Methanol Fuel Cell**

Methane decomposition based on metal catalysts initiates the production of hydrogen without CO impurities and with formation of catalytic filamentous carbon. Filamentous carbon does not deactivate the catalysts for a long time due to its morphology and it is possibly suitable as a catalyst support and adsorbent. Metals of the iron subgroup are traditionally used as the catalysts for this reaction. The first part of this presentation focuses on the investigation of structure of coprecipitated iron-containing ( $\text{Fe-Al}_2\text{O}_3$ ,  $\text{Fe-Co-Al}_2\text{O}_3$ ,  $\text{Fe-Ni-Al}_2\text{O}_3$ ) catalysts in the calcined and reduced states, as well as their catalytic properties in methane decomposition at 600-650°C and the evolution of the catalyst phase composition during the reaction.

The direct methanol fuel cell (DMFC) is promising due to the advantages of: low operation temperature plus a cheap and liquid fuel (easily transported and stored). Appropriate composition and structure of the DMFC's membrane electrode assembly (MEA) can significantly improve fuel cell performance. The effects of electrode loadings, fabrication methods, and textural and structural properties on DMFC performance will be discussed during the second part of this presentation.

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