

Layered Rare Earth and Transition Metal Materials: Synthesis, Modification and Catalytic Application

Yashan Zhang, Ph.D

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This research contains three parts; the first two parts of this thesis demonstrate the synthesis of rare earth layered materials and their application in biodiesel production as basic heterogeneous catalysts. Different rare earth layered materials were synthesized, characterized, modified, and investigated to find a better catalyst for the biodiesel reactions under mild conditions, and the potassium modified neodymium oxycarbonate was the best among them. Both conventional heating and microwave radiation methods were applied to carry out the transesterification reactions. Different parameters such as reaction time, temperature, reactants ratio, and catalyst amount were also studied in the biodiesel reactions to find a better, faster and cheaper way to achieve high biodiesel yields. The proposed reaction mechanism demonstrated the role of synthesized catalysts in this part of research.

The last part of this thesis is about the synthesis of hybrid transition metal hydroxide materials and their electrocatalytic application in oxygen reduction reactions. Layered hydroxide materials with different transition metal ratios were synthesized and characterized. Cyclic voltammetry and rotating disk voltammetry were carried out to evaluate the electrocatalytic property

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Yashan Zhang

B.E. & B.A., Dalian University of Technology, 2007

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