

# Sintesis Katalis Ru/CeO<sub>2</sub> Nanosphere dan Efek Penambahan Logam Fe pada Katalis untuk Reaksi Dehidrogenasi Senyawa Amonia Boran = Synthesis of Ru/CeO<sub>2</sub> Nanosphere Catalyst and the Effect of Metal Fe Addition to the Catalyst for Dehydrogenation Reaction of Ammonia Borane

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## Abstrak

Energi hidrogen yang dipertimbangkan sebagai sumber energi baru ramah lingkungan pengganti energi fosil semakin digencarkan pengembangannya. Salah satu senyawa yang berguna sebagai pembawa hidrogen adalah amonia boran (NH<sub>3</sub>BH<sub>3</sub>) dengan kandungan hidrogen sebesar 19,6 wt%. Telah disintesis katalis Rutenium berpenyangga CeO<sub>2</sub> Nanosphere untuk reaksi dehidrogenasi amonia boran dan dilakukan penambahan logam Fe ke dalam katalis. Karakterisasi XRD, XRF, SAA, TEM, dan Spektroskopi Raman dilakukan terhadap katalis. Diuji pengaruh variasi morfologi, komposisi, temperatur, konsentrasi NaOH, dan durabilitas katalis terhadap reaksi dehidrogenasi amonia boran. Katalis Ru<sub>0.75</sub>Fe<sub>0.25</sub>/CeO<sub>2</sub> Nanosphere memiliki hasil uji aktivitas katalitik tertinggi dengan nilai TOF sebesar 153,714 h<sup>-1</sup> pada suhu 308 K. Nilai energi aktivasi (E<sub>a</sub>) yang didapatkan dari variasi temperatur sebesar 37,587 kJ/mol.

.....Hydrogen energy is considered to be the new resource of clean and renewable energy compared to fossil fuel. Ammonia borane (NH<sub>3</sub>BH<sub>3</sub>) is known as one of the hydrogen carrier compounds which contain 19,6 wt% of hydrogen. Ruthenium catalyst supported by CeO<sub>2</sub> Nanosphere has been successfully synthesized and the addition of Fe metal to the catalyst has been carried out for dehydrogenation of ammonia borane purposes. Some characterizations such as XRD, XRF, SAA, TEM, and Raman Spectroscopy were tested on the catalyst. Variations of morphology, composition, temperature, concentration of sodium hydroxide, and durability tests were carried out to evaluate their effect on the reaction. The result shows that Ru<sub>0.75</sub>Fe<sub>0.25</sub>/CeO<sub>2</sub> Nanosphere catalyst exhibits the highest catalytic activity measured by TOF value 153,714 h<sup>-1</sup> under 308 K. Activation energy is obtained by temperature variation in the value of 37,587 kJ/mol.