

Catalytic reaction of liquid organic hydrogen carriers for comparing kinetic reaction rate and hydrogen storage capacity

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Liquid organic hydrogen carrier(LOHC) is promising material capable of reversibly storing and releasing hydrogen in the liquid phase among various hydrogen storage methods. Representatively the most widely known materials are 9-ethylcarbazole and Toluene, but they have not yet met the physical properties (volume capacity, storage capacity, reaction temperature, reaction pressure, etc.) required for commercialization. For example, in the case of 9-ethylcarbazole, heat of dehydrogenation reaction is low, but hydrogen storage capacity is small, and in the case of Toluene, hydrogen storage capacity is large, but heat of dehydrogenation reaction is high. In this study, a widely used LOHC material was selected and the hydrogenation/dehydrogenation reaction was evaluated under a temperature and pressure suitable for commercialization. The dehydrogenation reaction rate of 3-Methylbiphenyl is slightly lower than that of 9-ethylcarbazole, but it is superior to other substances including Toluene, and the hydrogenation reaction rate is also excellent. As a LOHC material, 3-Methylbiphenyl can be considered sufficiently as a candidate material to meet commercialization.