New Reaction Systems Based on Poly(*N*-isopropylacrylamide)-Supported Catalysts

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In modern synthetic organic chemistry, the development of an efficient reagent or catalyst recycling systems is regarded as one of the most important topics. A great deal of effort has been invested in devising methodology for this purpose. Although various types of recyclable catalytic systems using solid reagents and catalysts have been explored, it is difficult to retain or raise the activities relative to those of homogeneous counterparts. Recently, much attention is focused on the creation of catalytic systems that exploit stimuli-responsive materials such as ionic liquids or fluorous compounds.
We focused on the unique potentiality of poly(*N*-isopropylacrylamide) (PNIPAAm), which undergoes thermally reversible changes between hydrophilic and hydrophobic states in water. The affinity of PNIPAAm-supported tungsten catalyst for organic substrate in water was controlled by external temperature change. Application of this catalyst intelligence to design a novel catalytic system brought both a remarkable acceleration of the reactivity and an ease of catalyst recycling in the oxidation reaction with hydrogen peroxide. Alternatively, we also prepared PNIPAAm supported ruthenium catalysts and PNIPAAm supported palladium catalysts and established a valuable catalyst recycling strategies based on the stimuli-responsive intelligence of PNIPAAm chain. The present results open up a facile alternative to access the creation of recyclable catalytic systems. Such utilization of intelligent polymeric catalyst may offer multifunctional advantages in both further modifications and applications.