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Nanocarbon as Catalyst for Metal-free Catalytic Reactions

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Metal or metal oxides are conventional catalytic materials well-developed for many industrial reactions. Recently, there are many efforts to develop metal-free catalysts due to the limited natural resource, for the environmental protection and for energy saving.

We have used nanostructured carbons, especially carbon nanotubes, as catalyst for the production of styrene from oxidative dehydrogenation of ethyl benzene and for the activation of n-butane into C₄ olefines. We found that carbon as the catalytic substance has significant advantages over the conventional metal-supported systems owing to its unique controllability of both its surface acidity/basicity and π -electron density through surface functionalization. The performance of nanocarbons in the mentioned two reactions, the comparison with industrial catalysts and the possible reaction mechanism will be presented and discussed.