# Nanocarbons as Catalyst in Styrene Synthesis

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Nanocarbons (multiwalled carbon nanotubes and onion-like carbon) are tested for the oxidative dehydrogenation of ethylbenzene to styrene. The catalytic performances are compared with these using carbon black and graphite as catalysts. The tested nanocarbons are catalytic active in the reaction. The highest yield is achieved by using onion-like carbon as catalyst. The combustion stability of graphite, carbon nanotubes and onion-like carbons give stable catalytic performances on stream. The comparison of onion-like carbons as a model catalyst with other carbon materials gives the criteria for efficient carbon catalyst. It has been shown that the microstructure of the $sp^2$-bound carbon material was of paramount importance in order to obtain high and stable efficiencies. The well-defined and oxygen-free surface of OLC rendered them a valuable model to derive criteria for designing efficient carbon catalysts and to put forward a reaction model. The OLC material showed the highest styrene yield (62%) at the highest stable ethylbenzene conversion when compared to carbon nanotubes (54%) and graphite (44%) respectively, in correlation with a decreasing basal plane - edge/kink site ratio, whereas carbon black was completely combusted on stream. The perfectness of these nanocarbons provided enough stability towards oxidation and was essential for gas phase oxygen activation. A reaction model for oxidative dehydrogenation on carbon catalysts is proposed too. Our findings provide a new perspective for the application of nanostructured carbon materials.

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