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Poster abstract:

Oxidative Dehydrogenation of Ethylbenzene: exploring the active sites' nature and regeneration

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Styrene is one of the most vital monomers in petrochemicals industry. It is widely used in the manufacture of resins, plastics, and lattices/emulsion polymers. Its annual worldwide production is approximately 23 million tons.

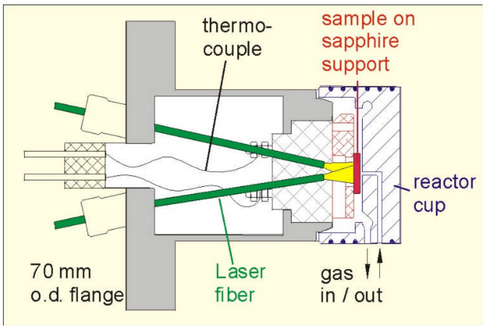
Currently, the production of styrene is mainly based on the catalytic dehydrogenation of ethylbenzene over metal oxide based catalysts. Mainly Iron oxide based catalysts are used in the presence of steam, and the process is carried out at temperatures higher than 600 ^oC. The main drawbacks of this process is the low conversion achieved, the need for high steam-to-hydrocarbon ratios and the high endothermicity of the reaction.

The oxidative dehydrogenation of ethylbenzene (ODH):

$$C_6H_5C_2H_5 + \frac{1}{2}O_2 \rightarrow C_6H_5C_2H_3 + H_2O$$

is a promising alternative process in which the reaction is complete, exothermic and can be carried out at lower temperatures. However such process requires an active and selective oxidation stable catalyst. For this purpose Carbon can act as a catalyst and its notable active and passive properties have attracted a growing significance.

It is believed that the reaction takes place over the oxygenated functional groups at the surface. The main goal of our study is to clarify and understand the way in which these surface oxygenated groups are regenerated after the reaction. Different mechanisms were suggested in which these oxygenated groups are re-established by the interaction with oxygen. HOPG (Highly Oriented Pyrolytic Graphite) is used as a model catalyst, and its interaction with oxygen is investigated. A home-made in-situ micro flow reactor is used that enables the on-stream monitoring of all reaction products of interest under realistic reaction conditions, while analysis of the catalyst before and after the reaction using surface science methods can be performed after transferring the sample into an ultrahigh vacuum system.



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