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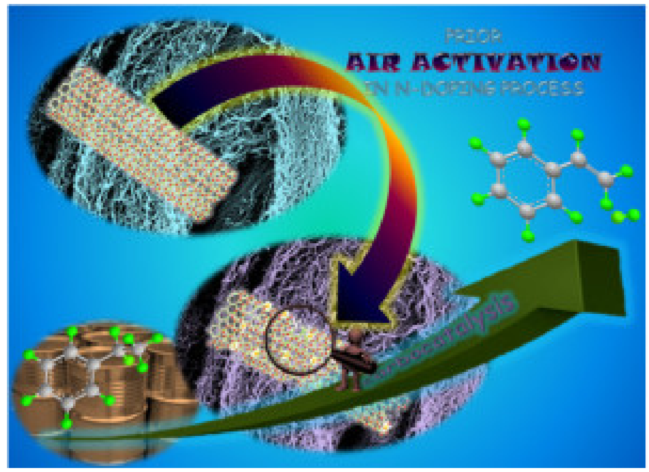
Tuning surface/interface of nanocarbon: promoted catalysis



Catalysis is the cornerstone for chemical industries. The development of low-cost sustainable catalysts with high catalytic activity, selectivity, and stability under mild conditions remains at the heart of modern material chemistry, green chemistry, and catalysis fields for academic and practical aspects. Although the metal catalysts have currently been playing major roles in various industrial transformation processes, they still suffer from many inherent disadvantages such as low-availability, high cost, susceptibility to gas poisoning, detrimental effects on our environment, besides the residual metal in products. Owing to the broad availability, environmental acceptability, corrosion resistance, and unique surface properties, nanocarbon materials have been demonstrated to be promising and sustainable low-cost metal-free alternative to metal-based catalysts for organic synthesis, hydrogen production, photodegradation of organic pollutants, the crucial oxygen reduction reaction in fuel cells, and as counter electrode catalyst for solar cells. Nowadays, the carbocatalysis has already attracted great attention throughout the world, and become the foreland and hot topic in the heterogeneous catalysis and sustainable chemistry. However, the low-cost and facile large-scale production of the nanostructured carbon materials for industrial application is highly desirable but remains a challenge.

Surface and interface of solid catalysts are the places where the reactions take place. Tuning surface and interface of catalysts can be a sapiential strategy for fabricating highly efficient solid catalysts. The surface ketonic group and structural defects have been established to be active for direct dehydrogenation of ethylbenzene. Therefore, the development of an efficient method to enrich surface ketonic group and structural defects is highly desirable. In this work from ACM research group, Dalian University of Technology, a facile, low-cost, but efficient two-step approach including prior air activation and subsequent pyrolysis of carbon nanotube and melamine has been presented to synthesize the N-doped carbon nanotube with the increased structural defects, the enriched surface ketonic carbonyl group, which in turn significantly promotes the catalytic performance for clean and energy-saving production of styrene through direct dehydrogenation of ethylbenzene under steam- and oxidant-free conditions.

Publication

Nitrogen-doped carbon nanotubes via a facile two-step approach as an efficient catalyst for the direct dehydrogenation of ethylbenzene.
Zhao Z, Dai Y, Ge G, Guo X, Wang G
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