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Graphene based solid-state catalysis: From computational understanding to applications

Graphene has attracted enormous interests due to its potential applications in solid-state physics. Recently, it has been shown that graphene can also be used as excellent solid-state catalysts for various of chemical reactions, therefore opening new opportunities for graphene applications in solid-state chemistry. The pristine graphene itself is chemically quite inert. Consequently, the central issue in graphene catalysis is to activate graphene using practical physical or chemical ways. Many ways have been proposed to enhance reactivity of graphene such as doping graphene with metal impurity atoms, applying a modest mechanical strain in graphene, creating vacancy defects, and decorating graphene with functional groups. However, the real applications of graphene solid-state catalysts (GSSC) are still rather limited so far mainly due to the fact that all those proposed methods require the direct treatment of graphene, which is very difficult for large-scale fabrication in a controllable manner. In this talk, we proposed a promising new way of activating graphene: To activate graphene by doping the underlying metal substrate with single atom impurities or vacancies. In this way, the direct treatment of graphene is no longer needed, therefore the large-scale industry applications become possible. More interestingly, the proposed method implies an unusual type of single-atom catalysts. We expect the results presented to stimulate new experiments and open new avenue for future design and applications of graphene-based single-atom catalysts.

Speaker Biography

Zhang C earned his PhD in Computational Physics in University of Florida, USA. Now, he is an Associate Professor for the department of physics and chemistry in National University of Singapore. He has published 80+ papers on reputable journals that have been cited over 4500 times, and his publication H-index is 28. Currently, he is the guest editor of Catalyst for the special issue "graphene based catalysis" and an editorial board member of scientific reports.

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