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Unraveling Surface Basicity and Bulk Morphology Relationship on Covalent Triazine Frameworks with Unique Catalytic and Gas Adsorption Properties

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Abstract

© 2017 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim Activity and selectivity are key features at the basis of an efficient catalytic system for promoting the steam- and oxygen-free dehydrogenation (DDH) of ethylbenzene to styrene. The catalyst stability under severe reaction conditions, the reduction of leaching of its active sites, and their resistance to deactivation phenomena on stream are other fundamental aspects to keep in mind while synthesizing new catalytic materials for the process. Although the recent use of single-phase (doped or undoped) carbon nanomaterials has significantly contributed to improving this catalysis, the relationship between materials morphology and their chemical surface properties still remains to be addressed. Here, a class of highly microporous, N-doped covalent triazine frameworks (CTFs) with superior activity and stability in the DDH compared to the benchmark systems of the state-of-the-art is reported. Notably, a com parative analysis of their chemico-physical properties has unveiled the role of the “chemically accessible” surface basicity on the catalyst passivation on stream. Finally, the unique properties of the synthesized CTFs are demonstrated by their excellent H 2 storage capability and CO 2 absorption that rank among the highest reported so far for related systems.

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Keywords

CO capture 2, covalent triazine frameworks, hydrogen storage, metal-free catalysis, steam-free ethylbenzene direct dehydrogenation

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