Facile and large-scale synthesis of ordered microporous graphene-like carbon using zeolite templates for catalytic support

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Thermal carbonization of organic substances within zeolite micropores is a route to synthesize highly ordered microporous carbon materials. However, the narrow pores size of zeolite often leads to carbon deposition outside the pores as well as at the internal pores. Such a non-selective carbon deposition is so far the chief obstacle to research activities on the carbon synthesis using zeolite as templates.
Here, we demonstrate that graphene-like carbon frameworks can be selectively formed inside the zeolite micropores without carbon deposition at the external surfaces by incorporating carbonization metal catalysts into the zeolite pores. FAU, EMT and beta zeolite templates yield three-dimensional sp^2-carbon nanostructure composed of uniform and ordered micropores. The carbon has two orders of higher electric conductivity than sucrose-based mesoporous carbon with amorphous framework. Such physical properties are ideal as a catalytic support that efficiently accommodates metal nanoparticles with high surface-to-volume ratios. Furthermore, the synthesis can be scaled up readily, which is highly sought aspect for catalytic application.