Electrochemical Oxygen Reduction by Atomically Dispersed Pt: Selective Production of H_2O_2 instead of H_2O

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Maximum atom efficiency as well as distinct chemoselectivity is expected for electrocatalysis on atomically dispersed metal species, however its realization was difficult because the most widely used electrocatalyst support, carbon, cannot stabilize them due to the lack of strong metal-support interactions. Here we report that a sulfur-doped zeolite-templated carbon, simultaneously exhibiting extra-large sulfur content (17 wt% S) and unique carbon structure (*i.e.*, highly curved 3-dimensional networks of graphene nanoribbons) can stabilize relatively high loading of Pt (5 wt%) in the form of atomically dispersed Pt species. In oxygen reduction reaction, the catalyst did not follow the general 4-electron pathway producing H_2O, but selectively produced H_2O_2 *via* a 2-electron pathway. Besides, the catalyst was also inactive in the consecutive H_2O_2 decomposition reactions, which makes the catalyst potentially promising for the production of an important fine chemical, H_2O_2, while generating electricity in commercialized fuel cell systems.