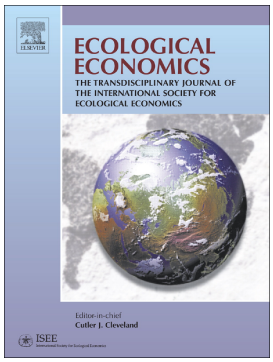

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Stability of Carbon-Supported Palladium Nanoparticles in Alkaline Media: A Case Study of Graphitized and More Amorphous Supports

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Abstract

The stability and degradation mechanism of graphitized (Graphene nanosheets) and more amorphous (Vulcan XC-72R) carbon-supported palladium nanoparticles was investigated. Coupling identical-location transmission electron microscopy (ILTEM) and electrochemistry enabled to correlate the distribution of the Pd nanoparticles under accelerated stress test (up to 1000 cycles between 0.1 and 1.23 V *vs*. RHE, in a 0.1 M NaOH solution at 25°C) with changes in electrochemical accessible surface area (ECSA). The carbon-supported Pd nanoparticles undergo similar rates of degradation in terms of electrochemical surface areas on both supports. However, their mechanisms of degradation differ: on amorphous carbon, the primary mode of degradation is Pd nanoparticles detachment (and minor agglomeration), whereas on graphitized supports it is more likely their coalescence and dissolution/redeposition. “Bulk” carbon-corrosion is negligible in both cases, as proven by *ex*