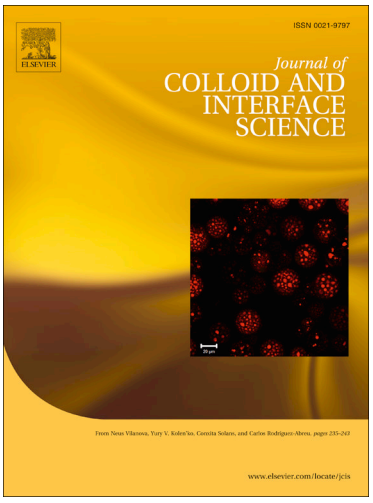

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ABSTRACT

The objective of our work is to improve low-temperature fuel cell catalysts by increasing the surface area to augment the efficiency of catalytic reactions. Reduced graphene oxide (rGO) supports were prepared by adding N-containing derivatives of polydopamine (PDA) and loading of Pt and Pt-based metal alloy nanoparticles were accomplished for catalyst preparation. To study the effects of surface modification on catalyst activity, the GO surfaces modified by addition of PDA (PDA-rGO) were richer in oxygen- and nitrogen-containing functional groups, which reduced the number of graphene defects. Reduction of metals (M = Pt, Pd, Pt_xPd_y where x and y = 1–3) by $NaBH_4$ produced M/GO (metal on GO) and M/PDA-rGO (metal on PDA-rGO) catalysts. Examination of morphology and chemical composition confirmed that the existence of particle size on M/PDA-rGO catalysts was smaller than that on M/GO catalysts in agreement with calculated electrochemically active surface areas (ECSA). Electrochemical analysis was conducted to evaluate the catalyst activity and stability. The prepared catalysts had significantly greater surface areas as a result of association between the metal nanoparticles and the oxygen and nitrogen functional groups on the rGO supports. The catalysts also exhibited lower onset potentials and greater current