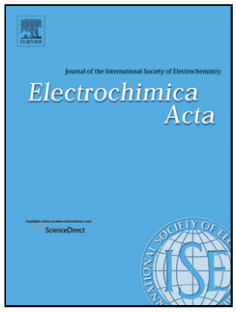

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Oxygen reduction at the surface of polymer/carbon and polymer/carbon/spinel catalysts in aqueous solutions

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Abstract

The mechanism and kinetics of oxygen reduction were studied at such composite catalysts as PANI/C, PPy/C, transition metal oxides/C and PPy/C/transition metal oxides by the method of rotating disc electrode. It was shown that for the PANI/C and PPy/C catalysts there are almost no diffusion limits and the sluggish stage of the reaction is chemo sorption of oxygen at the polymer surface followed by desorption and formation of hydrogen peroxide (a two-electron mechanism). In contrast, for the inorganic composites transition metal oxides/C the limiting stage is oxygen diffusion, whereas the calculated effective number of electrons is approximately 3.0.

In organic/inorganic composite catalysts of the PPy/C/transition metal oxides type oxygen reduction proceeds by a mixed diffusion-adsorption mechanism to form water (a four-electron mechanism). The calculated effective number of electrons for such available catalysts is 3.8 in alkaline electrolytes, which, by efficiency, approaches the ideal value 4.0 for noble metals.

Keywords: *ORR, composite catalysts, conducting polymers, transition metal oxides, spinels.*

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