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Electro-oxidation of methanol and formic acid by PdAu@ Nafion-graphene nanocomposite

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Recently, the advancement of the electrocatalysts for alternative energy sources such as hydrogen and fuel cells are drawing more attention since energy sources in an attempt to relieve the pollution and energy crises. These days Pd nanoparticles are promising anode catalysts of fuel cells due to their better catalytic activity for electro-oxidation of methanol, ethanol and formic acid. Pd based catalysts are much cheaper and exhibit potential advantages in applications of fuel cells compare with Pt-based catalysts which have been extensively investigated. A facile electrochemical route was used to synthesize PdAu@Nafion-graphene at room temperature. The morphologies of the prepared PdAu@ Nafion-graphene nanocomposite was characterized by scanning electron microscopy (SEM), transmission electron microscopy (TEM), energy-dispersive X-ray spectrometer (EDS), X-ray diffraction (XRD), The electrocatalytical activities of prepared catalyst were evaluated using cyclic voltametry (CV). PdAu@Nafion-graphene nanocomposite showed highly enhanced electrocatalytical activity and stability towards the electrooxidation of methanol and formic acid.

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Modeling of multi-dimensional polymer chain distributions in order to determine polymer architectures

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Control of end-use properties of branched polymers such as low-density Polyethylene (ldPE) produced at industrial scale in the molecular level is difficult since experimental methods fail to detect most decisive microstructural properties. Therefore mathematical models have become increasingly important in predicting the interesting microstructural information and are of great interest for industrial applications. ldPE free radical polymerization is modeled deterministically for batch and tubular reactors in three independent dimensions of chain length, number of branch points and number of combination points. Scission and termination by combination reactions have been considered in the modeling scheme. Since termination by combination in the presence of transfer to polymer is known to possibly lead to gel formation, the models are tested in the gel regime. The resulted distributions from all models are in good agreement to the results obtained by Monte Carlo simulations and the gel content is correctly predicted. These results prove that the implementation of these complex multi-dimensional models is successful.

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