Polymer- Graphene Ultra-thin Composite Langmuir-Schaefer films: Charge Transport Properties and Electrochemiluminescence Applications

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Abstract

A cation and anion exchange Polymer-Graphene (PG) nanocomposite dispersion was utilized to fabricate PG ultra-thin films using the Langmuir-Schaefer (LS) technique.
The incorporation of $[Ru(bpy)_3]^{2+}$, $[Fe(CN)_6]^{4-}$, $[Ru(NH)_6]^{3-}$ and Tripropylamine (TPA) as redox probe within the LS films has been achieved. The morphology and thickness of the films were studied using SEM, AFM, Raman and optical microscopies. The charge transport properties of PG LS films were investigated using cyclic voltammetry and chronoamperometry. The as-prepared PG LS films revealed interesting morphological features and peculiar charge transport properties. These studies confirmed the successful incorporation of ions and revealed that the introduction of graphene into Polymer LS films not only facilities the electron transfer, but also improves the long- term stability of the sensor. To investigate the suitability for electroanalytical applications, PG LS films were successfully tested towards detection of tripropylamine and dopamine using Electrochemiluminescence (ECL).

Figures

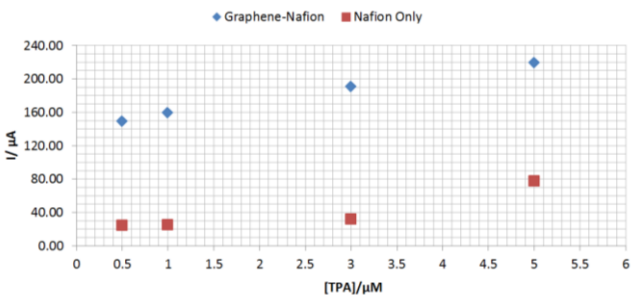

Figure 1: *CVs of a 10-layers Nafion–$[Ru(bpy)_3]^{2+}$ Vs Nafion-Graphene–$[Ru(bpy)_3]^{2+}$ films recorded in 0.1 M NaCl as supporting electrolyte; scan rate of 0.25 Vs^{-1}*

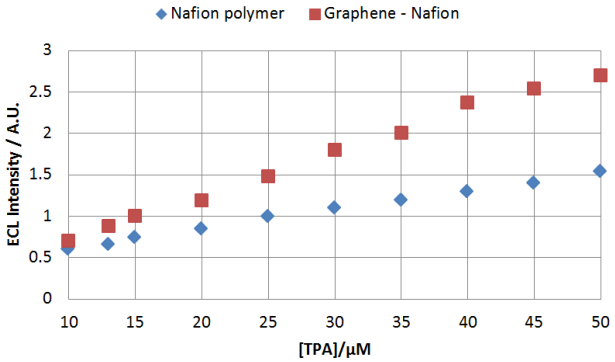

Figure 2: *ECL of a 10-layers Nafion-Graphene–$[Ru(bpy)_3]^{2+}$ films recorded in 0.5 M PBS as supporting electrolyte; scan rate of 0.25 Vs^{-1}*