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Coreactant Electrochemiluminescence at Nanoporous Gold Electrodes

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Abstract

The electrochemiluminescence (ECL) performances were comparatively investigated at flat and nanoporous gold (NPG) electrodes of different thicknesses (120 and 200 nm) and roughness factors (f_r). The phenomena were studied using either tri-n-propylamine (TPrA) or peroxydisulfate ($S_2O_8^{2-}$) as sacrificial coreactant and Ruthenium(II)-tris(2,2'-bipyridine) ($[Ru(bpy)_3]^{2+}$) as emitting species. The experiments performed using TPrA showed, at first glance, a linear dependence of the ECL emission with respect to the effective surface area of the NPG electrodes. However, ECL signals were not stable in the measuring conditions, presumably due to amine absorption on the metal surface, leading to electrode corrosion and modification of the surface morphology. The experiments made using peroxydisulfate as coreactant provided conversely a stable ECL response, about proportional to the effective electrode surface area, in the considered range of thicknesses.

Keywords: Electrochemiluminescence; Nanoporous gold; tri-n-propylamine; peroxydisulfate

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