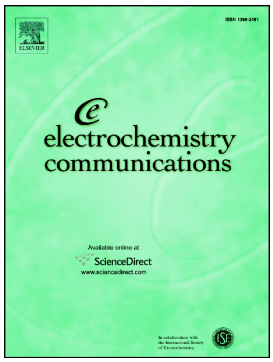

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Exploring the suitability of different electrode materials for hypochlorite quantification at high concentration in alkaline solutions

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Abstract

A comparison of the electrochemical performance of noble metal, sp^2- and sp^3-carbon electrodes towards the reduction of concentrated hypochlorite (ClO^-; 0.02 M – 1.88 M), an alkaline (pH ~ 13) and chemically oxidising solution, is presented. Boron-doped diamond (BDD) gave no discernible electrochemical response whilst all other electrodes showed an electrochemically irreversible cathodic response in the following order (most facile electron transfer): Pt > Au > edge plane pyrolytic carbon (EPPG) ≈ sp^2-containing BDD > basal plane (BP) sp^2 carbon > glassy carbon ≈ highly ordered pyrolytic graphite. Reduction at sp^2-BDD occurred at a similar potential to EPPG, but with much lower currents, suggesting edge-plane-like sites are the active sp^2 sites in this sp^2-BDD, but at much lower surface coverage than in EPPG. Finally, both EPPG and sp^2-BDD showed linear current versus [ClO^-] responses over the concentration range 0.02 M–1.41 M (R^2 >0.995).

Keywords: Free chlorine, hypochlorite, boron doped diamond, sp^2 carbon, edge plane pyrolytic graphite

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