Development of a graphite and polyurethane composite electrode modified with an organofunctionalized nanosilica for the determination of Pb(II) in water

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In this study, graphite and polyurethane composite electrodes were modified with nanosilica synthesized from a coal fly ash derived leachate using a sol-gel method.[1] The nanosilica was then organofunctionalized with (3-chloropropyl)trimethoxysilane and 2-mercaptobenzothiazole[2]. An electrode composed of 57.5% graphite, 37.5% polyurethane and 5.0% nanosilica modifier (*m/m*) was assembled and characterized using EDX, SEM, TG/DTA and EIS. Various parameters for differential pulse anodic stripping voltametric determination of Pb^{2+} were optimized, these included the supporting electrolyte concentration (KCl 0.1 mol L^{-1}, pH 6.0), pulse amplitude (50 mV), scan rate (25 mV s^{-1}), accumulation potential (−1.1 V *vs.* Ag/AgCl) and accumulation time (270 s). Using the optimized conditions, an analytical curve for Pb^{2+} was obtained with the organofunctionalized nanosilica modified electrode. A linear response was obtained between 4.0 x 10^{-8} and 2.0 x 10^{-7} mol L^{-1}, with a limit of detection (LOD) of 8.3 x 10^{-9} mol L^{-1}. The electrode was then applied in the determination of Pb^{2+} in mineral water samples by the standard addition method, yielding recoveries ranging between 96 – 105%, without interference from concomitant species present in the samples.

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