Abstract

Atomization of plumbane in a novel dielectric barrier discharge (DBD) plasma atomizer has been optimized employing detection by atomic absorption spectrometry. The performance of the DBD atomizer was subsequently compared to that of a conventional externally heated quartz tube atomizer (QTA). Lead from a standard solution was converted to plumbane by chemical reduction with sodium borohydride using an identical hydride generator for both atomizers. Argon at a flow rate of 175 cm^3 min^{-1} was found as the best discharge gas while the DBD power supply rate was optimized to 22 W. The inner surface of the DBD atomizer was passivated by dimethyldichlorosilane (DMDCS) resulting in a twofold increase of sensitivity. Sensitivity of 0.10 s ng^{-1} Pb and a limit of detection of 0.82 ng cm^{-3} Pb were reached in the DBD atomizer with DMDCS-modified surface under the optimum atomization conditions. Better performance was achieved in a QTA atomizer, in which detection limit of 0.59 ng cm^{-3} Pb was reached and sensitivity was doubled (0.22 s ng^{-1} Pb) in comparison with DMDCS-modified DBD.