

AN ELECTROCHEMICAL SENSOR FOR COPPER(II)

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Copper is one of the most useful and common metals in existence. Unfortunately, it has also become environmentally hazardous in the latter decades of the 20th century. Copper is a common pollutant in several industrial and laboratory discharges and in plumbing systems. Unlike many other pollutants, copper(II) is very difficult to detect without sophisticated lab equipment. Recently developed methods for the Cu(II) detection at trace level is based on stripping voltammetry where a pre-concentration step is essential.

An alternative approach, which would eliminate the pre-concentration step would be the use of modified electrodes based on electroactive complex-forming ligands. Alizarin is such a ligand which is electroactive in the +1.0 V to -1.0 V potential domain when adsorbed onto the glassy carbon electrode and its presence can be confirmed by the typical cyclic voltammogramme of alizarin in the buffered aqueous phase.

Alizarin is not, however, specifically selective to Cu(II). Many metal ions including Pb(II), Cr₂O₇²⁻, CrO₄²⁻, Co(II), Sr(II), Hg(II), Ni(II), Fe(II), Ag(I) and Al(III) in the aqueous phase are prone to complex with alizarin. In this work, we have shown that the proper choice of pH of the solution and the use of effect on Cu(II) addition at micromolar level to alizarin modified electrodes in the buffered solution enables the selective determination of Cu(II) at trace levels in the aqueous medium. In pH 4 acetate buffer, a characteristic peak of alizarin in alizarin modified glassy carbon electrode found at +0.54 V shows systematic decrease upon sequential addition of Cu(II) and the amperometry at this potential thus enables the selective detection of Cu(II) at trace levels in the aquatic environment.

