**Electrochemical Sensors for the Detection of Pesticide Residues in Water – Role of Energetically Suitable Electrode Interface**

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**Abstract**

Chronic toxicity of pesticide residues in water bodies imposes a major threat to human lives and hence the development of an effective detection strategy will aid the healthcare, environment, and agrochemical sectors. The development of non-enzymatic sensors with associated electrodics can address the demand for the selective electrochemical detection of pesticide residues in water. In this context, we have developed electrochemical sensors for detecting Imidacloprid, Carbendazim, and Chlorpyrifos pesticides in water through an appropriate charge transfer interface materials. Functionalized Multi-walled Carbon Nanotubes with Ethylenediamine tetraacetic acid and its derivatives (f-MWCNT/EDTA, f-MWCNT/NTAA Na3.H2O, and f-MWCNT/ N-(2-C2H5O) ED (CH3COONa)3) have been used as the energetically suitable electrode interface materials for the selective detection of the abovesaid pesticides. The charge transferability characteristics of sensors while quantifying the pesticides were keenly analysed using electrochemical & optical studies and the same has been substantiated using Density Functional Theory (DFT). The performance evaluation of these sensors was carried out for varying internal & external conditions as well as for commercial pesticide formulations and validated with the standard high performance liquid chromatography technique.