

MIL-101 (Fe) modified carbon paste electrode for the efficient simultaneous detection of hydroquinone and catechol

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Four Fe-based metal-organic frameworks (MIL-101(Fe), MIL-53(Fe), MIL-88(Fe), and MIL-100(Fe)) were synthesized using a solvothermal method, and further characterized by X-ray diffraction, Fourier transforms infrared spectroscopy, Scanning electron microscopy, and X-ray photoelectron spectroscopy. The synthesized Fe-MOFs were used to fabricate the modified carbon paste electrodes (CPE) for simultaneous detection of hydroquinone and catechol. Among the MILs (Fe) modified CPEs, MIL-101(Fe)/CPE exhibited extraordinary electrochemical sensitivity because of MIL-101 (Fe)'s excellent conductivity. The oxidation potential separation of hydroquinone and catechol achieved 190 mV. Compared with CPE, the oxidation currents of hydroquinone and catechol at MIL-101/CPE were 10-fold higher and the reduction currents were 5-fold higher. The linear range was 2 - 90 μM for hydroquinone and 2 - 100 μM for catechol, and the detection limit was 0.58 μM and 0.62 (S/N = 3) μM for hydroquinone and catechol. Furthermore, the application of MIL-101 (Fe)/CPE has been validated in an actual river water sample with the satisfied recoveries of 90.21 - 102.36% and 91.11 - 102.19% for hydroquinone and catechol, respectively.

Keywords: Electrochemical detection, MILs (Fe), Hydroquinone and catechol, Modified carbon paste electrode, Differential pulse voltammetry

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