Electrocatalytic detection of l-cysteine using molybdenum POM doped-HKUST-1 metal organic frameworks

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Abstract

Glass carbon electrodes (GCE) were modified with metal organic frameworks (MOFs) containing molybdenum polyoxometallates (Mo POMs) in a copper benzene tricarboxylate framework (HKUST-1). The Mo POMs were introduced via one-pot synthesis (Mo2) and post-synthetic modification (Mo1) techniques. The electrode modifiers were characterized by powder X-ray diffraction (PXRD), Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), and thermal analysis. The modified electrodes' oxidation capacity toward l-cysteine was studied. Mo POMs significantly improved electron transfer kinetics compared to the bare GCE. The best Mo POM doped electrode (Mo1-GCE) had a catalytic rate constant of 2.2×104 M^{-1} s^{-1} and a limit of detection of 3.07×10^{-7} M. Under the employed experimental conditions, the detection response for l-cysteine was very fast (within 0.1 s) for all the modified electrodes and selective toward l-cysteine in the presence of other amino acids.