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Abstract

A two-dimensional (2D) Ni based metal-organic framework (MOF) nanosheets were synthesized using a one-step solvent-thermal method. The as-prepared nanosheets were characterized by transmission electron microscopy (TEM), scanning electron microscopy (SEM), powder X-ray diffraction (XRD) and energy disperse spectroscopy (EDS) mapping. Ni-MOF nanosheet was first time found to used as a peroxidase mimetic with catalytic activities and could catalyze the oxidation of the substrate 3,3,5,5-tetramethylbenzidine (TMB) in the presence of hydrogen peroxide (H_2O_2). Catalytic mechanism analysis suggested the enzymatic kinetics of Ni-MOF nanosheets followed typical Michaelis-Menten theory and Ni-MOF nanosheets possess a higher affinity for two substrates (TMB and H_2O_2) than horseradish peroxidase (HRP). Furthermore, Ni-MOF nanosheet was applied to establish an H_2O_2 colorimetric sensor which deserves a wide linear range of 0.04 ~ 160 μM and a low detection limit of 8 nM. Also the application of this sensor for H_2O_2 detection in human serum and disinfectant was demonstrated and satisfactory results were obtained. Thus, the simple and sensitive Ni-MOF/TMB/H_2O_2 colorimetric system has great promising applications in clinical medicine and food environment analysis.

Graphical abstract