

# **Cation-Exchange in Metal–Organic Framework as a Strategy to Obtain New Material for Ascorbic Acid Detection**

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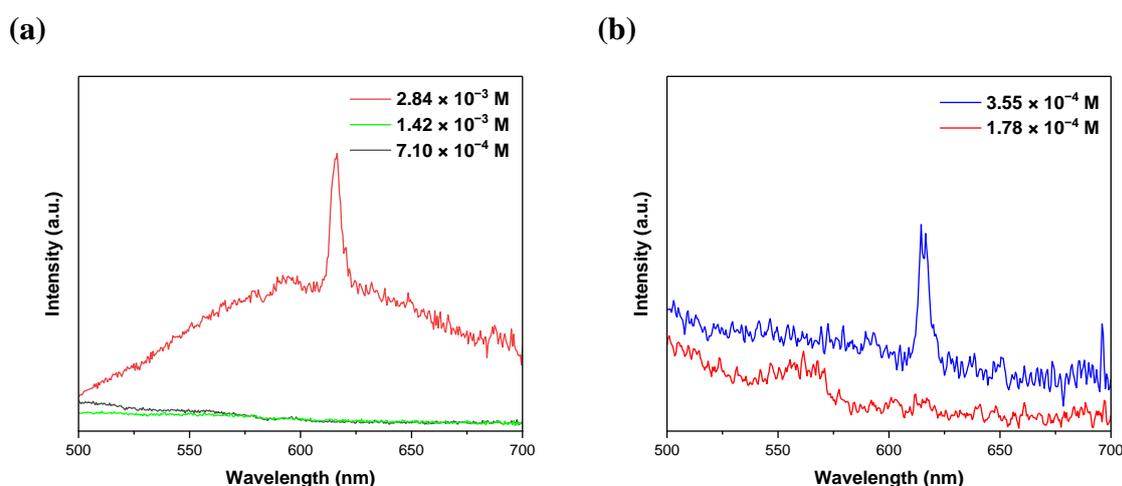
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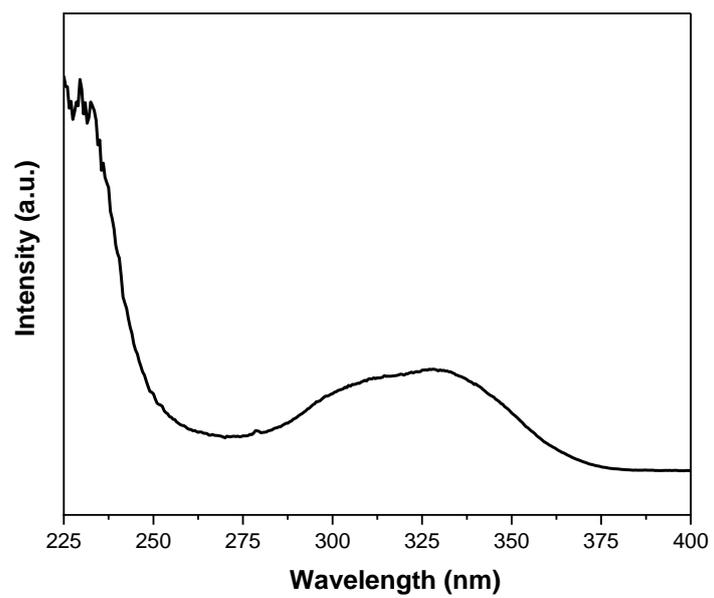
**Table S1.** Content of Eu and Cu (wt.%) in  $\text{NH}_4[\text{Cu}_3(\mu_3\text{-OH})(\mu_3\text{-4-carboxypyrazolato})_3]$  after different times of cation-exchange process based on ICP-OES.

Sample	Element content (wt.%)
2 h of ion-exchange process	Cu: $26.16 \pm 0.83$
	Eu: $2.66 \pm 0.18$
4 h of ion-exchange process	Cu: $26.27 \pm 0.54$
	Eu: $3.33 \pm 0.04$
6 h of ion-exchange process	Cu: $26.91 \pm 0.41$
	Eu: $4.30 \pm 0.05$

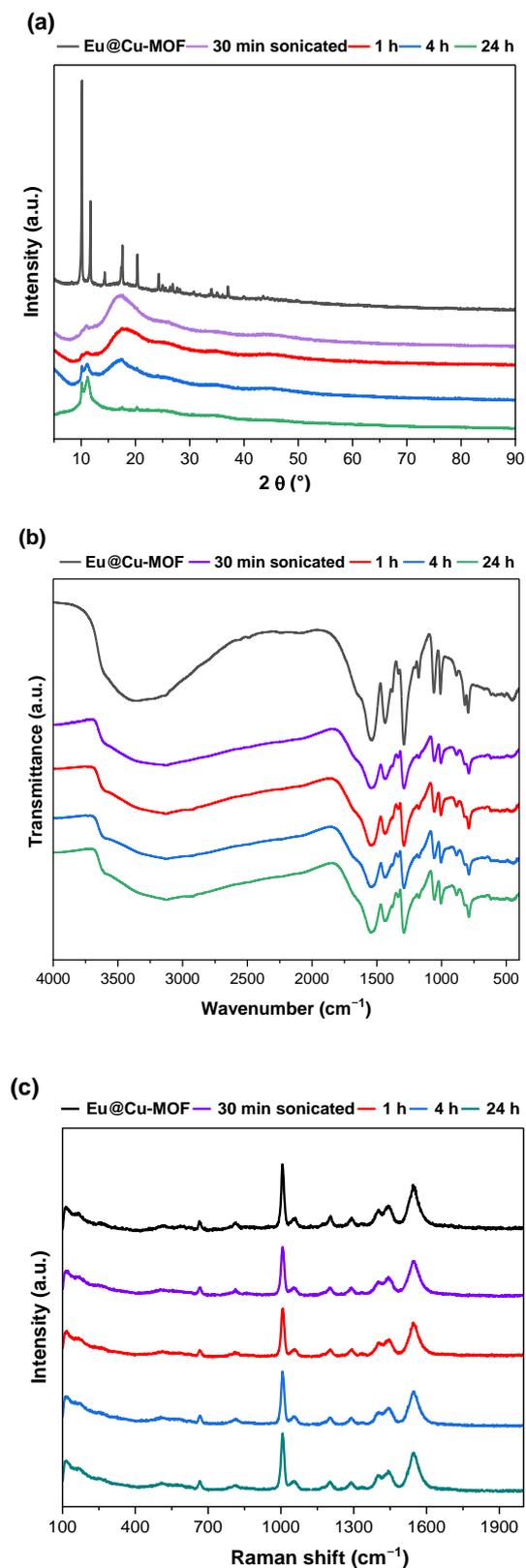
As far as the cation exchange time is concerned, shorter (2 h) and longer (6 h) time was also tested. Eu@Cu-MOF obtained after 2 h of the cation-exchange process showed a characteristic emission band of europium at 617 nm and a broad copper-originating band for the concentration of AA of  $2.84 \times 10^{-3}$  M (Figure S1a) but not for lower concentrations. For the initially proposed time of the ion-exchange process (4 h) the detection limit of AA was much lower (set up at  $3.55 \times 10^{-4}$  M). The longer time, up to 6 h of the process, did not change the detection limit of AA (Figure S1b). As presented in Table S1, the europium content in the sample after 2 h of the ion-exchange process was estimated to be 2.66 wt.%, which is lower than in the system after 4 h of reaction (3.33 wt.%). Therefore, it may explain the lower sensitivity of the system after 2 h-exchange. On the other hand, europium content in the sample after 6 h of the ion-exchange process was higher than for 4 h (4.30 wt.%); however, it did not change the detection limit of the proposed system.



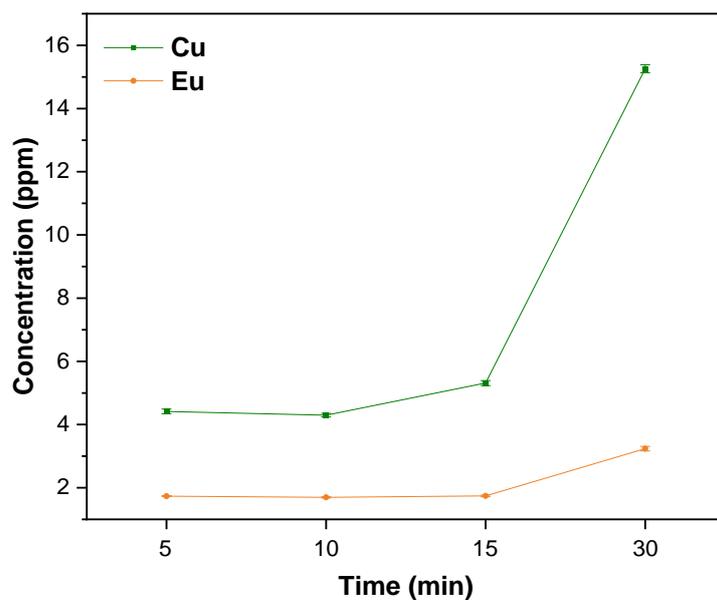
**Figure S1.** Emission spectra of Eu@Cu-MOF after cation exchange for 2 h (a) and 6 h (b) for different concentrations of AA (after treatment for 15 min).



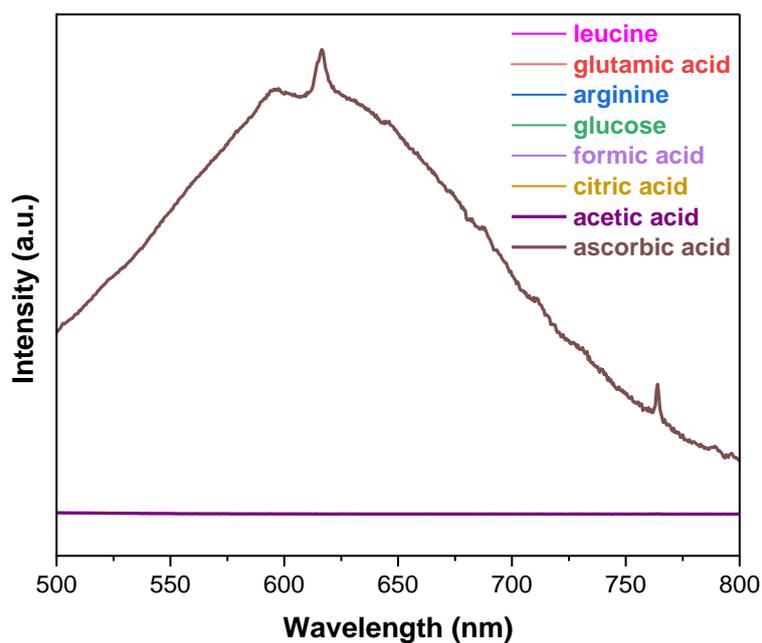
**Figure S2.** Excitation spectra of Eu@Cu-MOF ( $\lambda_{em} = 616.5$  nm).



**Figure S3.** Determination of stability of Eu@Cu-MOF in deionized water using (a) XRD, (b) IR, and (c) Raman spectroscopy.



**Figure S4.** Changes in the concentration of europium and copper in the solution after treatment of Eu@Cu-MOF with ascorbic acid.



**Figure S5.** Emission spectra for Eu@Cu-MOF for different aqueous solutions of biological molecules and carboxylic acids at a concentration of  $1.00 \times 10^{-2}$  M.

**Table S2.** Relative composition (%) of the Cu species.

	<b>Cu(II)–O<sub>ligand</sub></b>	<b>Cu(II)–O<sub>cluster</sub></b>	<b>Cu(I)</b>
Eu@Cu-MOF	84.49	15.51	0
5 min	89.03	6.27	4.7
30 min	87.8	7.17	5.03