Supporting Information for:

Rapid Ambient Direct Growth of HKUST-1 via Atmospheric Pressure Plasma Treatment

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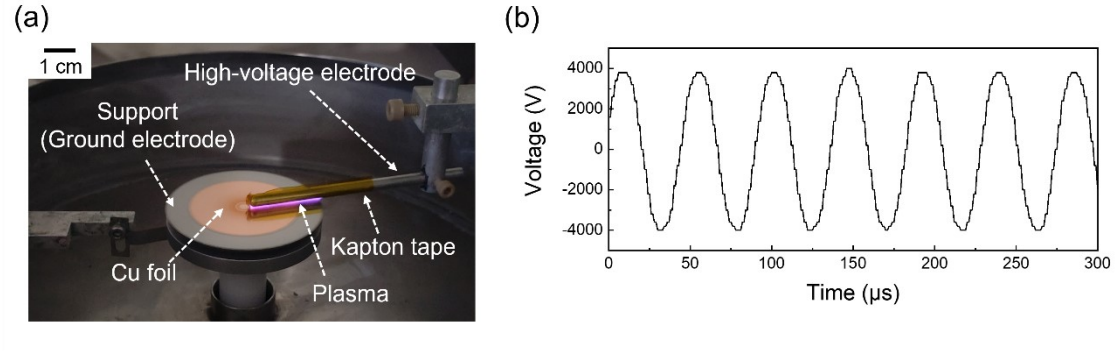

Figure S1. Experimental setup and electrical characteristics of the plasma-assisted synthesis. (a) Photograph of the atmospheric-pressure plasma treatment system irradiating the cupper substrate. The grounded rotating electrode used as the substrate holder has a diameter of 50 mm. (b) Typical voltage waveform applied during the synthesis process.

Table S1. Comprehensive summary of reaction outcomes for different metal substrates and ligands under plasma, solvothermal, and chemical precipitation conditions. Film: Formation of continuous crystalline MOF film. Amorph.: Formation of amorphous surface products. Powder: Precipitation of crystalline coordination polymers from solution. N.R.: No reaction observed (surface remained unchanged or solution remained clear).

Method	**Precursor Source**	**Ligand**	**Cu**	**Zn**	**Ni**	**Al**
Plasma	Metal Foil	H_3BTC	Film	Amorph.	N.R.	N.R.
Solvothermal	Metal Foil	H_3BTC	N.R.	N.R.	N.R.	N.R.
Solvothermal	Nitrate Salt	H_3BTC	Powder	Powder	Powder	Powder
Amine Addition	Nitrate Salt	H_3BTC	Powder	Powder	Powder	N.R.
Plasma	Metal Foil	2-MIM	N.R.	N.R.	N.R.	N.R.
Solvothermal	Metal Foil	2-MIM	N.R.	N.R.	N.R.	N.R.
Solvothermal	Nitrate Salt	2-MIM	N.R.	N.R.	N.R.	N.R.
Amine Addition	Nitrate Salt	2-MIM	N.R.	Powder	N.R.	N.R.

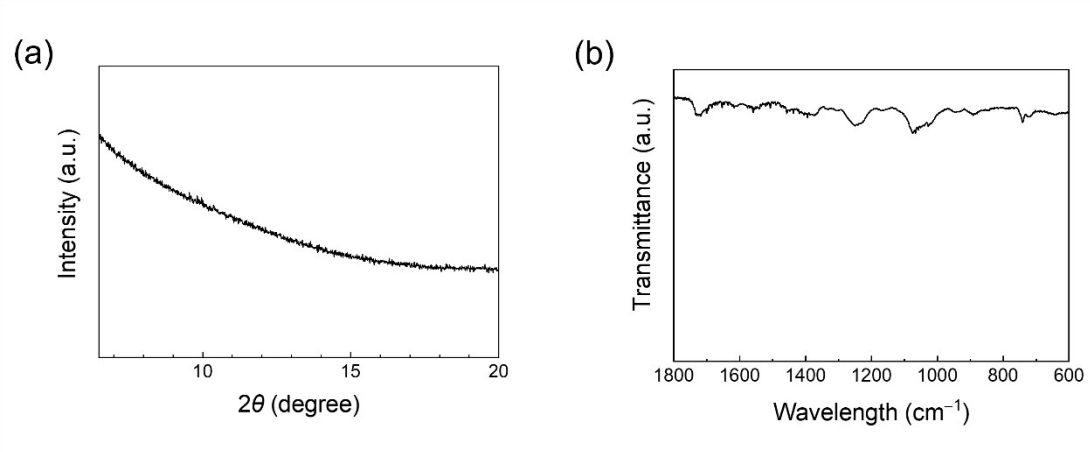

Figure S2. Control experiment examining the effect of thermal energy on film growth. (a) XRD pattern and (b) FTIR spectrum of the copper foil treated with the H_3BTC/EG solution in a solvothermal autoclave at 150 °C for 24 h. The absence of characteristic HKUST-1 peaks confirms that thermal energy alone is insufficient to drive the reaction in the reductive EG environment.

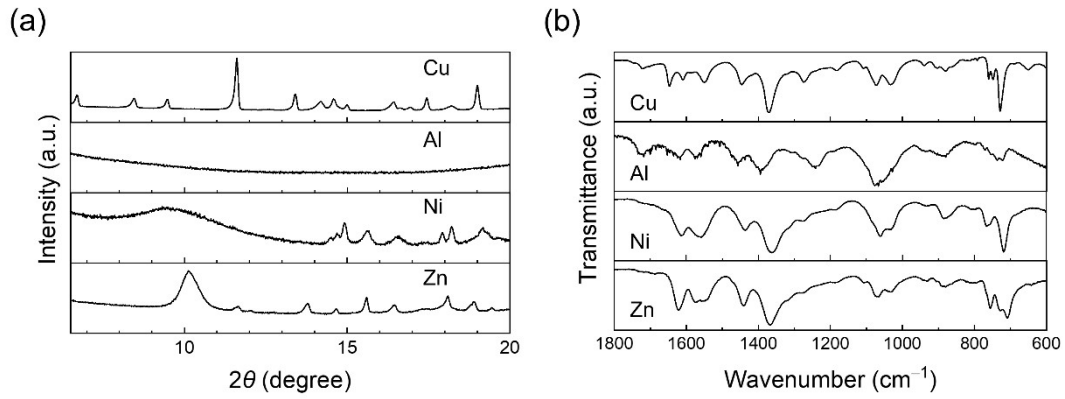

Figure S3. Verification of chemical coordination capability using metal salts. XRD patterns and FTIR spectra of the solid products obtained by solvothermal reaction of metal nitrates ($Cu(NO_3)_2$, $Zn(NO_3)_2$, $Ni(NO_3)_2$, and $Al(NO_3)_3$) with the H_3BTC/EG solution in a solvothermal autoclave at 150 °C for 24 h. The formation of precipitations for all metals were confirmed.