Supporting Information

Understanding the Electromagnetic Interaction of Metal Organic Framework Reactants in Aqueous Solution at Microwave Frequencies

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This supplementary information contains UV-visible absorption spectra of M(III) salts (Section 1) and dielectric data for M(III) salts and bases (Section 2). See main text for experimental set up.

SECTION 1: UV-Vis spectroscopy

UV-visible absorption spectra were collected at time intervals of 0, 2 and 24 h for each analyte. Spectra were recorded using Ocean Optics SpectraSuite 2.0 software and processed in Origin 8.0. Each spectrum was baseline corrected and intensities were normalized with respect to the highest peak (in all cases the highest peak is at *ca*. 300 nm). Spectra are displayed in the same scale as that in the main text. Peak maxima and shoulder positions are accurate to \pm 5.0 nm.



Figure S1: UV-Vis spectra of $Al_2(SO_4)_3.8H_2O$ in deionized water (0.7 mM) at 25 °C collected at time intervals of 0 minutes (black line), 2 and 24 h (red and blue lines, respectively).



Figure S2: UV-Vis spectra of $Al(NO_3)_3.9H_2O$ in deionized water (1.4 mM) at 25 °C collected at time intervals of 0 minutes (black line), 2 and 24 h (red and blue lines, respectively).



Figure S3: UV-Vis spectra of VCl₃ in deionized water (1.4 mM) at 25 $^{\circ}$ C collected at time intervals of 0 minutes (black line), 2 and 24 hours (red and blue lines, respectively).

Bands for $[V(H_2O)_6]^{3+}$ occur *ca.* 400 and 555 nm and for $[VCl_4]^-$ at *ca.* 696 and 1379 nm.¹ Bands displayed by vanadyl ions, VO^{2+} would arise at 410, 521 and 705 nm.²⁻⁵ However, it is not possible to unambiguously assign the spectra observed due to overlapping and broadness of the peaks.



Figure S4: UV-Vis spectra of FeCl₃ in deionized water (1.4 mM) at 25 $^{\circ}$ C collected at time intervals of 0 minutes (black line), 2 and 24 h (red and blue lines, respectively).



Figure S5: UV-Vis spectra of $Fe(NO_3)_3.9H_2O$ in deionized water (1.4 mM) at 25 °C collected at time intervals of 0 minutes (black line), 2 and 24 hours (red and blue lines, respectively).



Figure S6: UV-Vis spectra $Fe_2(SO_4)_3.5H_2O$ in deionized water (0.7 mM) at 25 °C collected at time intervals of 0 minutes (black line), 2 and 24 h (red and blue lines, respectively).

As for the UV-vis spectrum of VCl₃, it is not possible to unambiguously assign the spectra of the Fe(III) salts (Figures S4 to 6) owing to overlapping and broadness of the peaks $^{6-10}$



SECTION 2: Additional Dielectric Data

Figure S7: Plots of average dielectric constant (ϵ' , left axis) and average loss factor (ϵ'' , right axis) vs. frequency for Al(NO₃)₃.9H₂O in deionized water at three concentrations. ϵ' and ϵ'' were measured at three different temperatures for each solution at given concentration; 20 (ϵ' yellow, ϵ'' red), 40 (ϵ' blue, ϵ'' pink) and 60 °C (ϵ' green, ϵ'' black).



Figure S8: Plots of average dielectric constant (ϵ' , left axis) and average loss factor (ϵ'' , right axis) vs. frequency for Al₂(SO₄)₃.18H₂O in deionized water at three concentrations. ϵ' and ϵ'' were measured at three different temperatures for each solution at given concentration; 20 (ϵ' yellow, ϵ'' red), 40 (ϵ' blue, ϵ'' pink) and 60 °C (ϵ' green, ϵ'' black). Errors are represented by the thickness of each line.



Figure S9: Plots of average dielectric constant (ϵ' , left axis) and average loss factor (ϵ'' , right axis) vs. frequency for Cr(NO₃)₃.9H₂O in deionized water at three concentrations. ϵ' and ϵ'' were measured at three different temperatures for each solution at given concentration; 20 (ϵ' yellow, ϵ'' red), 40 (ϵ' blue, ϵ'' pink) and 60 °C (ϵ' green, ϵ'' black). Errors are represented by the thickness of each line.



Figure S10: Plots of average dielectric constant (ϵ' , left axis) and average loss factor (ϵ'' , right axis) vs. frequency for Fe(NO₃)₃.9H₂O in deionized water at three concentrations. ϵ' and ϵ'' were measured at three different temperatures for each solution at given concentration; 20 (ϵ' yellow, ϵ'' red), 40 (ϵ' blue, ϵ'' pink) and 60 °C (ϵ' green, ϵ'' black). Errors are represented by the thickness of each line.



Figure S11: Plots of average dielectric constant (ϵ' , left axis) and average loss factor (ϵ'' , right axis) vs. frequency for VCl₃ in deionized water at three concentrations. ϵ' and ϵ'' were measured at three different temperatures for each solution at given concentration; 20 (ϵ' yellow, ϵ'' red), 40 (ϵ' blue, ϵ'' pink) and 60 °C (ϵ' green, ϵ'' black). Errors are represented by the thickness of each line.



Figure S12: Plots of average dielectric constant (ϵ' , left axis) and average loss factor (ϵ'' , right axis) *vs.* frequency for NaOH in deionized water at three concentrations. ϵ' and ϵ'' were measured at three different temperatures for each solution at given concentration; 20 (ϵ' yellow, ϵ'' red), 40 (ϵ' blue, ϵ'' pink) and 60 °C (ϵ' green, ϵ'' black). Errors are represented by the thickness of each line.



Figure S13: Plots of average dielectric constant (ϵ' , left axis) and average loss factor (ϵ'' , right axis) vs. frequency for NH₄OH in deionized water at three concentrations. ϵ' and ϵ'' were measured at three different temperatures for each solution at given concentration; 20 (ϵ' yellow, ϵ'' red), 40 (ϵ' blue, ϵ'' pink) and 60 °C (ϵ' green, ϵ'' black). Errors are represented by the thickness of each line.

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