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Supporting Information

Tuning Efficiency of Multi-Step Energy Transfer in Host-Guest Antennae System based on Chalcogenide Semiconductor Zeolite through Acidification and Solvation of Guests

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Fig. S1 Power X-ray diffraction (PXRD) patterns of as-synthesized RWY, dye-loaded RWY and acid treaded samples.



Fig. S2 N₂ adsorption and desorption isotherms measured at 77 K for RWY \supset Cs⁺ and RWY \supset PFH⁺. The CsCl ion exchange was performed at 85°C for 48 hours and then dried. The RWY \supset PFH⁺ sample was obtained by immersing 40 mg of RWY \supset Cs⁺ in 10⁻³ M PFH⁺ solution at 298k for 2 days.



Fig. S3 N₂ adsorption and desorption isotherms measured at 77 K for the RWY \supset Cs⁺ and RWY \supset Py⁺, which was obtained by immersing 40 mg of RWY \supset Cs⁺ in 10⁻³ M Py⁺ solution at 298k for 2 days.



Fig. S4 The UV-vis absorption spectra of proflavine hemisulfate solution with different amount of H₂SO₄ added.



Fig. S5 PL emission spectra of proflavine hemisulfate solution with different amount of H₂SO₄ added.



Fig. S6 PL emission spectra of the mixed solution of proflavine hemisulfate and pyronine with different amount of H_2SO_4 added.



Fig. S7 PL emission spectra of acid-treated RWY host materials.

Samples	C (wt %)	H (wt %)	N (wt %)	
RWY⊃Cs ⁺	0.0989	0.200	Undetected	
RWY⊃PFH ⁺	4.0541	5.0274	2.2101	
RWY⊃Py ⁺	3.2082	4.7834	0.6502	

Table S1 C, H, N elemental analysis for $RWY \supset Cs^+$ and dye-loaded RWY.

Table S2 The energy transfer efficiency for dye loaded-RWY antenna system treated with different amount ofH2SO4. The sample was excited by using a 370 nm nano-LED.

H ₂ SO ₄ (µL)	RWY \supset Cs ⁺ (ns) (λ_{em} =420nm)	$RWY \supset (PFH^+ \& Py^+)$ (ns) (λ_{em} =420nm)	ET Efficiency (%)	RWY⊃PFH⁺(ns) (λ _{em} =519nm)	RWY \supset (PFH ⁺ &Py ⁺) (ns) (λ_{em} =519nm)	ET Efficiency (%)
0	3.50	3.03	14.0%	4.61	3.26	29.1%
20	3.48	2.82	19.5%	4.61	3.00	34.8%
40	3.47	2.34	33.7%	4.61	2.86	37.8%

Table S3 The maximum position of absorption and emission of PFH⁺ and Py⁺ in the RWY \supset (PFH⁺&Py⁺) host-guest composites treated by different solvents.

		H ₂ O	EtOH	THF	CH ₂ Cl ₂	DMF
PFH ⁺	Absorption (nm)	445	443	453	441	447
	Emission (nm)	519	510	510	505	509
Py+	Absorption (nm)	547	548	549	554	551
	Emission (nm)	569	568	572	571	568