

Supplementary material

Eco-friendly betanin hybrid materials based on palygorskite and halloysite

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I. Supplementary Figures

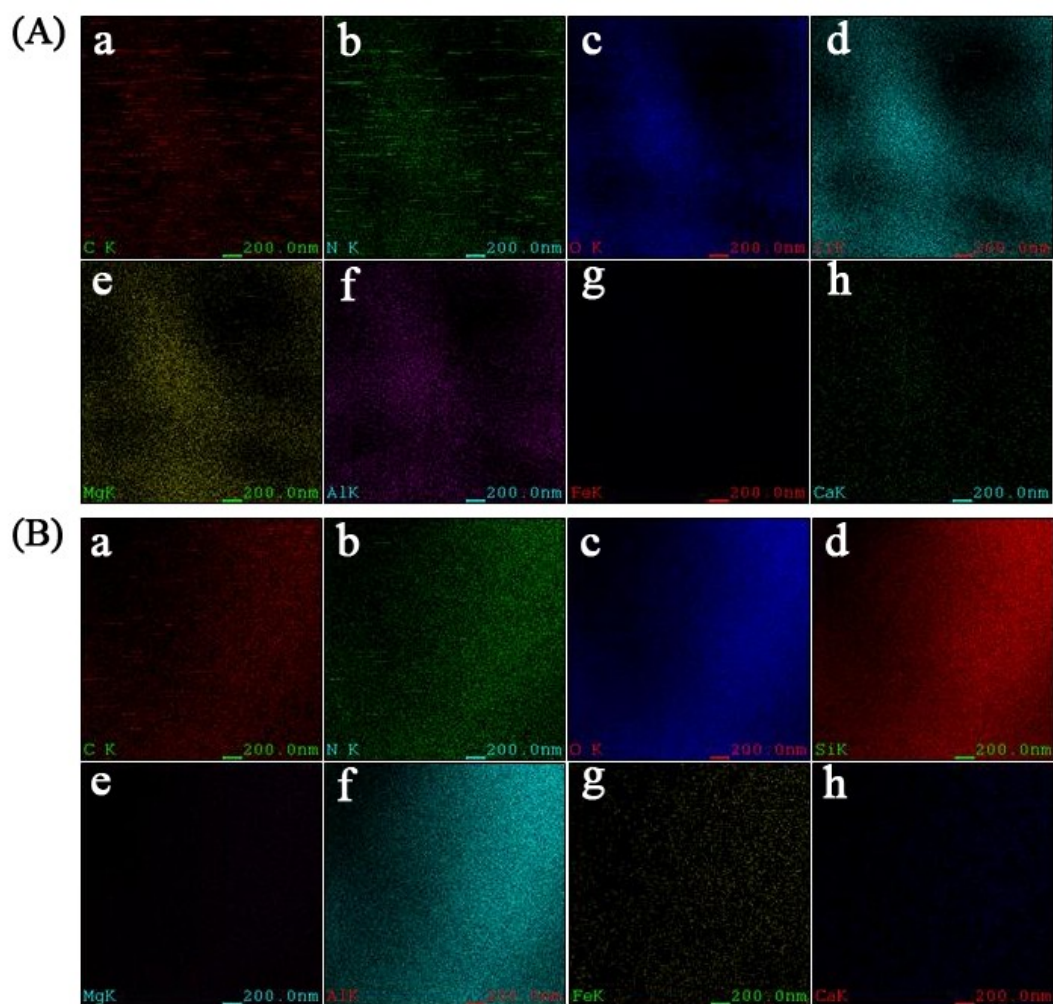


Figure S1. The element mapping images of (A) betanin/Pal and (B) betanin/Hal: (a) C, (b) N, (c) O, (d) Si, (e) Mg, (f), Al (g) Fe, (h) Ca.

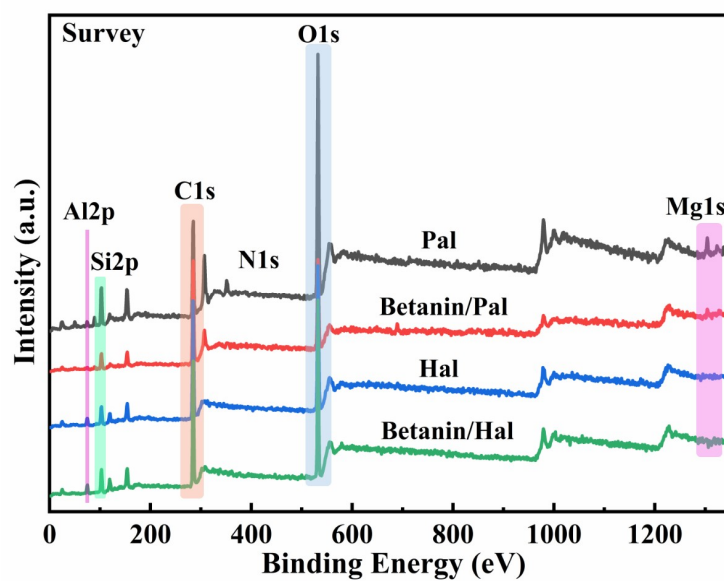


Figure S2. X-ray photoelectron spectra of Pal, betanin/Pal, Hal and betanin/Hal.

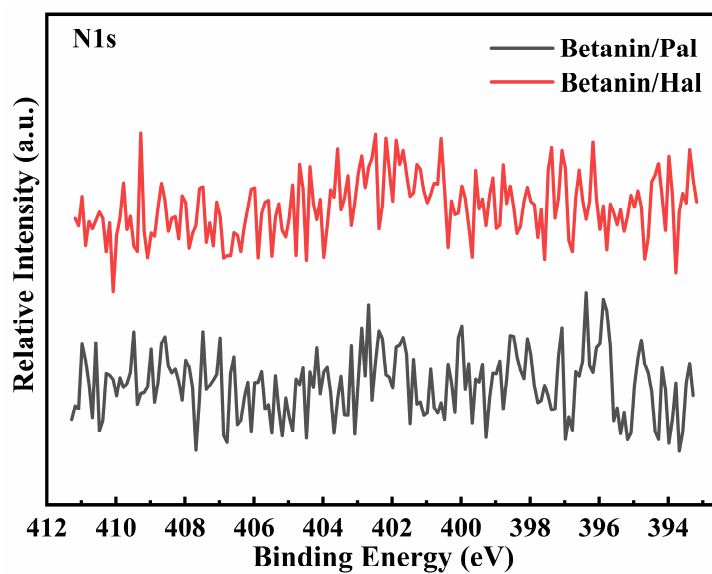


Figure S3. XPS high-resolution scanning spectra of betanin/Pal and betanin/Hal: N1s.

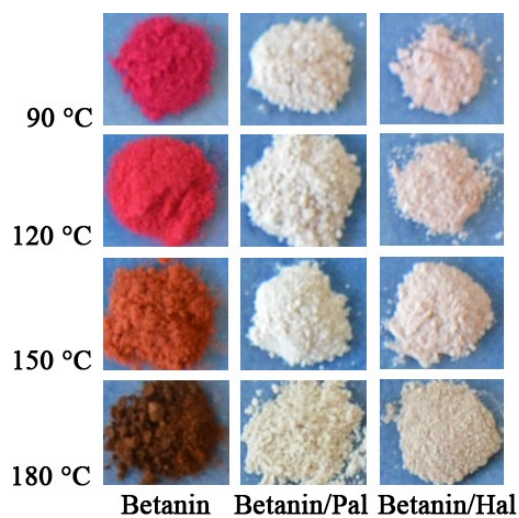


Figure S4. Digital images of the pure betanin, betanin/Pal and betanin/Hal at different heating temperatures

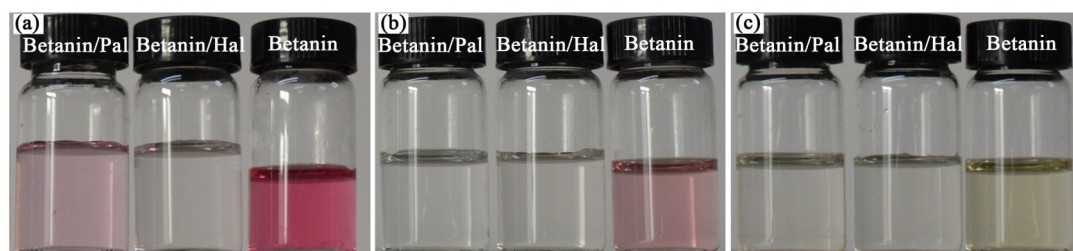


Figure S5. Digital images of the pure betanin and betanin desorbed from the betanin/Pal and betanin/Hal hybrid materials after being immersed for 24 h in (a) distilled water, (b) 0.1 M HCl and (c) 0.1 M NaOH, respectively.

II. Supplementary Tables

Table S1. Color parameters of pure betanin, Pal and Hal

Samples	Color parameters		
	L^*	a^*	b^*
Betanin	64.54	15.13	5.99
Pal	83.08	0.41	6.27
Hal	77.10	4.86	11.95