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Template-free Synthesis of Hierarchical Spindle-like γ-Al_2O_3 Materials and their Adsorption Affinity towards Organic and Inorganic Pollutants in Water

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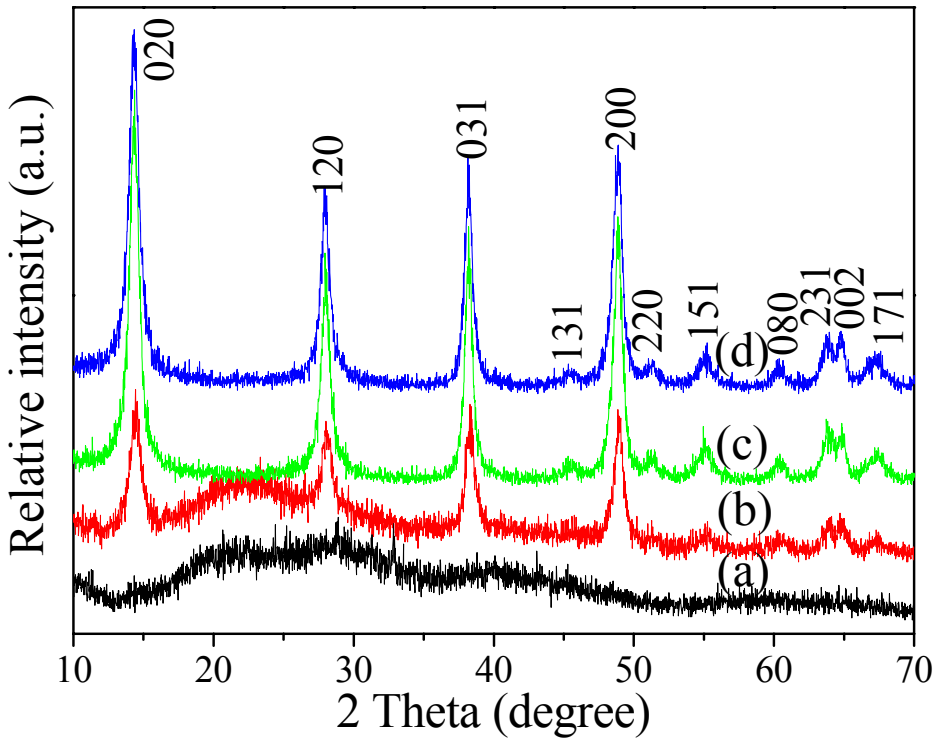

Figure S1. XRD patterns of the samples prepared from $Al(NO_3)_3 \cdot 9H_2O$ at 180 °C for different reaction time: (a) 10 min, (b) 15 min, (c) 0.5 h and (d) 1.0 h.

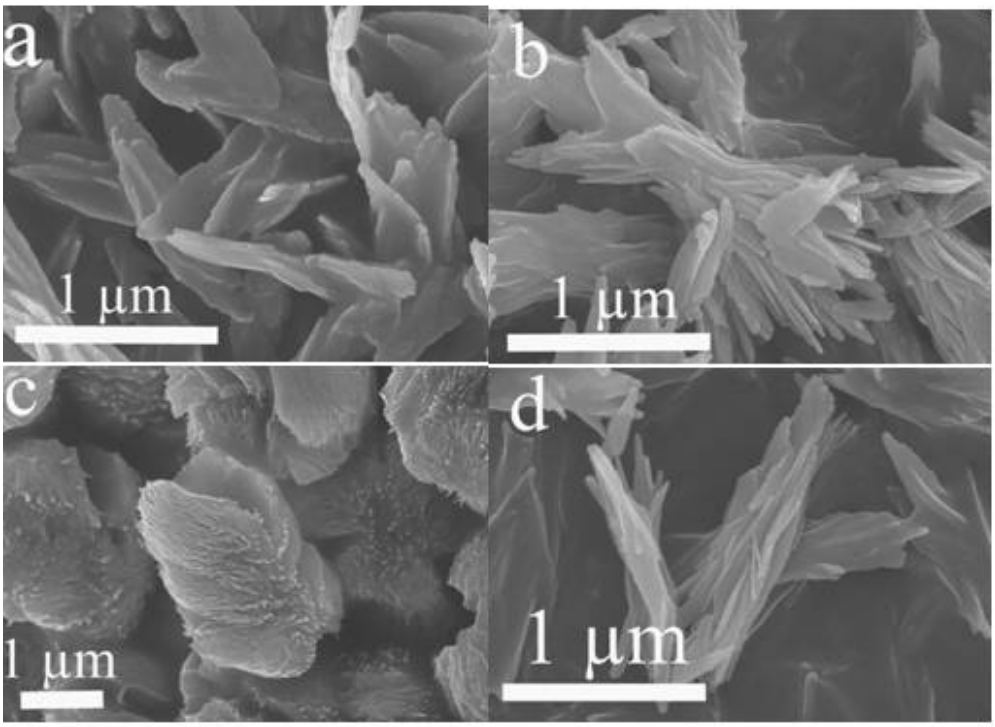

Figure S2. SEM images of the samples prepared at 180 ^{o}C using $Al(NO_3)_3 \cdot 9H_2O$ and urea as precursors under different conditions: (a) 20 h, (b) $[Al]^{3+}$=0.50 M, (c) and (d) the $CO(NH_2)_2/Al^{3+}$ molar ratios were 1:1 and 3.5:1, respectively.

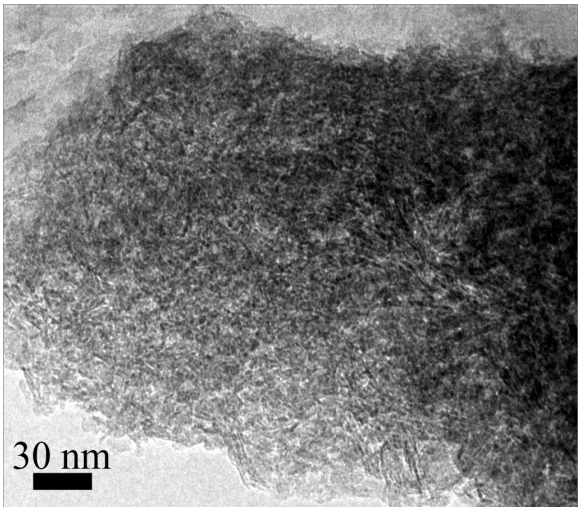

Figure S3. TEM image of the γ-Al_2O_3 prepared from the commercial boehmite (calcination conditions: 550 °C, 4 h)

Table S1. R_L value for Langmuir model and diffusion coefficient (K_d) for the adsorption of Congo red on hierarchical γ-Al_2O_3 samples.

Al source		Initial concentration of Congo red in solution (mg/L)					
		45	90	180	360	540	720
$Al(NO_3)_2$	R_L	0.367	0.225	0.127	0.068	0.046	0.035
	K_d	1230	992	640	399	315	238
$AlCl_3$	R_L	0.339	0.204	0.114	0.060	0.041	0.031
	K_d	1207	954	588	357	274	206