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Halloysite nanotubes as an effective adsorbent of chlorhexidine acetate

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Materials

Halloysite powder ($Al_2Si_2O_5(OH)_4 \times 2H_2O$, CAS No. 1332-58-7, Sigma-Aldrich, USA; https://www.sigmaaldrich.com/RU/en/search/1332-58-7?focus=products&page=1&perpage=30&sort=relevance&term=1332-58-7&type=cas_number) with a density of 2.53 g cm^{-3} and nanotube sizes of 30–70 nm × 1–3 μm (diameter × length), chlorhexidine acetate ($C_{22}H_{30}N_{10}Cl_2 \times 2C_2H_4O_2$, a purity of 99%, Jintan Pharmaceutical Co, China) and bacterial culture of *Escherichia coli* prepared from the probiotic preparation 'Colibacterin' (NPO 'Microgen', Russia) were used.

X-ray diffraction

The crystal structure of halloysite powders (before and after CA adsorption) was studied by X-ray diffraction using a DRON-UM1 (Russia) diffractometer (CuK_α radiation, $\lambda = 0.154$ nm) according to the method for powder samples. The samples were scanned over the range of 2θ = 5–70º at room temperature. A crystallographic database was used to identify the peaks. The interlayer distance was calculated using the Bragg formulas.

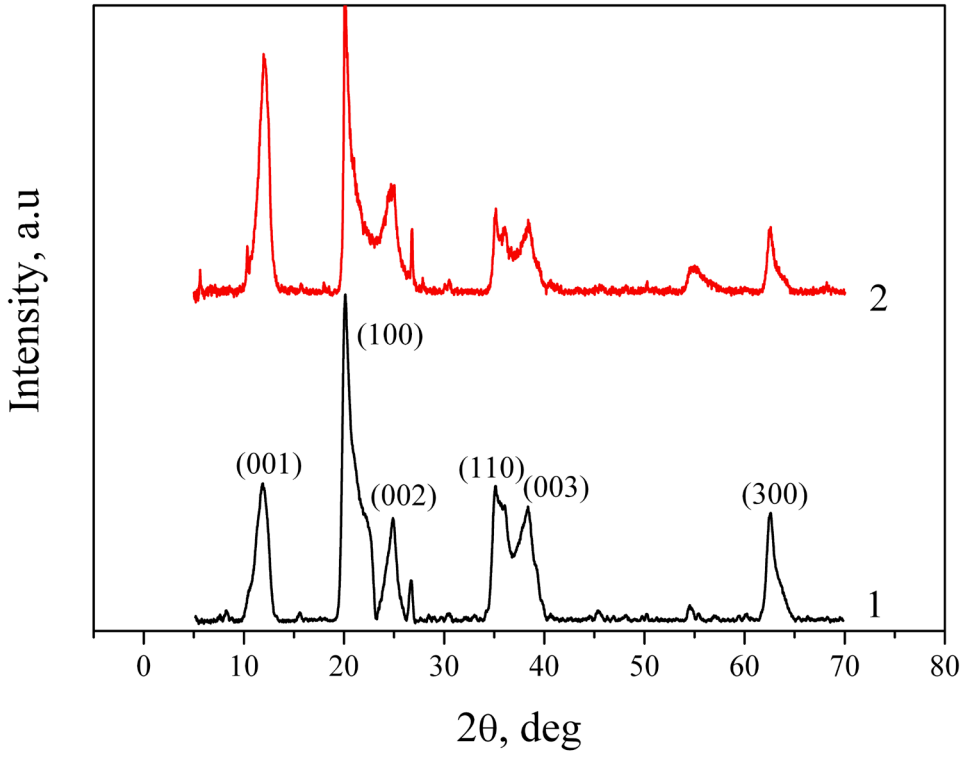

Figure S1 XRD patterns of (*1*) Hly and (*2*) Hly/CA.

EDS spectra

The morphology and elemental composition of halloysite before and after CA adsorption were examined using scanning electron microscopy. A scanning electron microscope Tescan Vega 3 SBH (Czech Republic) equipped with an energy-dispersive X-ray spectroscopy (EDS) detector was used.

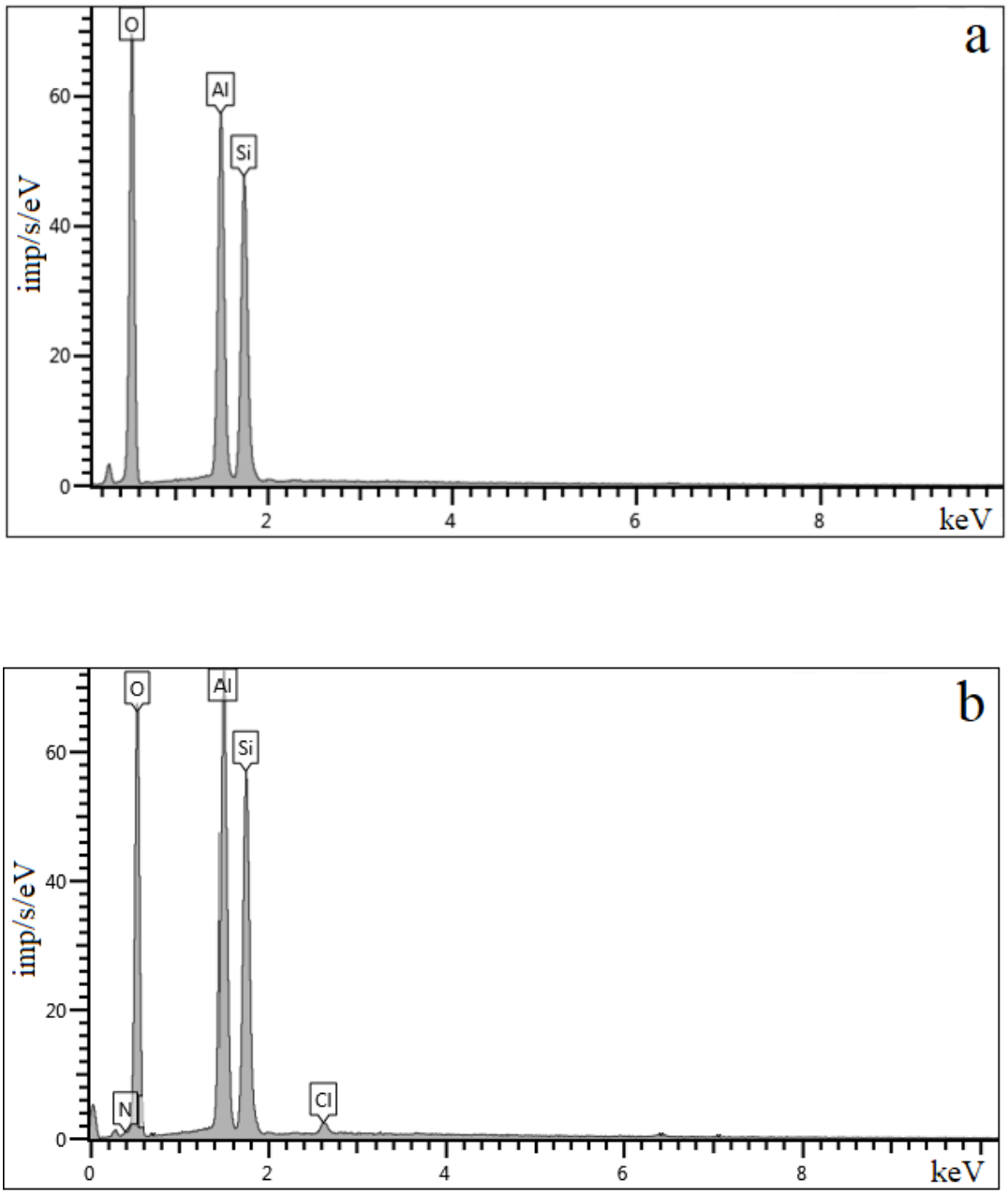

Figure S2 Energy-dispersive X-ray spectroscopy analysis: (*a*) Hly and (*b*) Hly/CA-1.5

Nitrogen vapor adsorption-desorption

The textural parameter values for halloysite before and after AC adsorption were determined by the method of low-temperature (77 K) nitrogen vapor adsorption-desorption with a QuantaChrome Nova 1200 (USA) surface area analyzer. Before the adsorption measurements, the powder had been degassed at 90 °C for 7 h.