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ACCEPTED MANUSCRIPT

Cocoa shell-deriving hydrochar modified through aminosilane grafting and cobalt particle dispersion as potential carbon dioxide adsorbent

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Abstract

This work was achieved to investigate the effect of both aminopropyltriethoxysilane (APTES) grafting and cobalt particles incorporation on the CO_2 adsorption behavior of cocoa shell based hydrochar (HC). Electron microscopy and measurements using nitrogen adsorption-desorption isotherms showed a structure swelling after APTES grafting, followed a compaction after Co particle insertion that attenuates the surface basicity. HC-APTES-Co displayed higher CO_2 retention capacity than its metal-free counterpart, in spite of its lower basicity and porosity. CO_2 adsorption was found to obey pseudo-first order kinetics and intra-particle diffusion mechanisms due to the predominance of physical interaction. This favors CO_2 condensation of higher CO_2 amount than predicted by the stoichiometry of carbamate formation. This concept allows envisaging promising prospects for plant-deriving adsorbents intended for CO_2 concentration and valorization into added values products.

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