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Technico-Economical Evaluation of CO_2 Transport in an Adsorbed Phase

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ABSTRACT

This work considers the possibility to transport CO_2 in an adsorbed phase and analyzes its cost as a function of transported quantities, transport conditions and transportation means. CO_2 adsorption capacities of 6 different adsorbents, comprising 4 activated carbons and 2 zeolites, were empirically evaluated in a given range of pressure and temperature. The adsorbent with the highest mass adsorption capacity (AC1), as well as another sorbent described in the literature (AC5) were selected to be used for CO_2 transportation by ships, trains or trucks. Their characteristics and performances were then used to develop an economic analysis of transportation costs and CO_2 emissions generated by the transport with or without storage. Economic evaluation of CO_2 batch transport shows that CO_2 transported in an adsorbed phase by train was seen to be almost competitive on distances between 250 and 500 km, in comparison to liquefied CO_2. One of the activated carbon appeared to be competitive on short distances by truck when transport was not followed by storage. Ship transport of adsorbed CO_2 on distances around 1500 km was competitive, when CO_2 was used as delivered; there was an over cost of only 16%, when there was storage after the transport. The CO_2 emissions generated by CO_2 transport and storage when transport is carried out in an adsorbed phase were smaller than the ones generated by liquid phase transport below 1200 km, 500 km and 300 km by ship, train and truck respectively, as a function of the adsorbent used. Adsorbed CO_2 transported on 1500 km by ship generated 27% less CO_2 emissions than liquid phase and 17% by train for a distance of 250 km and 16% by truck on 150 km, although these differences were decreasing with the distance of transport.

KEYWORDS

Component; Formatting; Style; Styling; Insert; CO_2; Transport; Adsorption; Activated Carbon; Economical Analysis

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