The effect of surface chemical properties of ethylenediamine modified waste tea activated carbon for CO$_2$ adsorption

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Abstract: This research investigates the ability of the ethylenediamine modified waste tea activated carbon (EDA-WTAC) used as an adsorbent for CO$_2$ adsorption. The waste tea (WT) was used precursor for preparing activated carbon (AC) because of the high amount of organic content, high amount of waste material from the tea shop, locally available and small sample size that’s easy for preparing process. The WT sample was impregnated with KOH and then carbonized at 500 °C on the conventional thermal process under air atmosphere to become waste teas activated carbon (WTAC). The physicochemical properties of adsorbent were characterized using the pore structure analysis, N$_2$ adsorption-desorption isotherm, Scanning electron microscopy, elemental analysis, Fourier transforms infrared spectroscopy and surface acidity/basicity. The CO$_2$ adsorption capacity was investigated by gas chromatography. The breakthrough curves demonstrated the outstanding performance of CO$_2$ selective on EDA-WTAC more than WTAC and WT. The maximum CO$_2$ adsorption capacity in this study was 9.54 percentage per gram, the highest efficiency in CO$_2$ adsorption indicates that the EDA-WTAC could be successfully used as an excellent adsorbent for CO$_2$ adsorption.

Keywords: Waste tea activated carbon; Ethylenediamine; Modified; Carbon dioxide; Adsorption