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Poly(amine) modified kaolinite clay for VOC capture

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KEYWORDS

VOCs, Volatile Fatty Acids, Kaolinite; PEI; Rendering; Environmental sampling.

ABSTRACT

Polyethylenimine (PEI) functionalized kaolinite clay was successfully prepared, characterized, and assessed for the remediation of volatile organic compounds (VOCs) comprising the aldehyde, carboxylic acid, and disulfide functional group classes. A gas chromatographic vapor capture assay evaluated the capability of unmodified and modified clay material to capture representative aldehyde, carboxylic acid, and disulfide VOCs in a laboratory setting. Unmodified kaolinite (Kao) clay was moderately or poorly effective at remediating these VOCs, while the poly(amine) functionalized Kao was capable of capturing VOCs in the vapor phase with reductions up to 100%. Sample cartridge tubes were packed with PEI-functionalized clay in order to assess their ability to reduce the detectable volatile fatty acid load at an open-air rendering plant in a relevant field test for applying these materials in a packed-bed scrubber application. The PEI-Kao packed cartridges were capable of significantly reducing the detectable concentration of volatile fatty acid effluent from the rendering operation. These volatile fatty acids are major contributors to nuisance odors associated with rendering.