

AN ABSTRACT OF A THESIS

GRANULAR ACTIVATED CARBON ADSORPTION OF SELECTED ORGANIC COMPOUNDS FROM A SYNTHETIC OIL SHALE PROCESSING WASTEWATER

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Master of Science in Civil Engineering

The energy crisis of the 1970's spawned research into Eastern Oil shales. A process was devised that could get high oil yields from the Eastern shale; however, the wastewater stream from the process was found to contain many toxic organics. Eight of the toxic organics were chosen for further study, and the feasibility of treating the wastewater with an activated carbon process was investigated.

Batch carbon adsorption experiments were conducted for both single-solute systems and a multiple-solute system containing all eight of the compounds. The objective of the batch experiments was to construct isotherms, and predict what would happen in a granular activated carbon column. A mini-column study was conducted on the synthetic wastewater using two 1.2 cm teflon columns at empty-bed contact times of 5.4 minutes and 8.8 minutes.

Aniline and phenol were found to have the highest affinity for the activated carbon, with 4-methyl pyridine having a slightly lower affinity. The other five compounds; acetone, methyl ethyl ketone, propionitrile, pyrrole, and thiocyanate; were found to have low affinity for activated carbon, and their removal was minimal. It was predicted that the mini-column study would result in early breakthrough of the five low affinity compounds, with 4-methyl pyridine, phenol, and aniline following.

The mini-column tests correlated well with the isotherm data. Acetone, methyl ethyl ketone, propionitrile, pyrrole, and thiocyanate had almost immediate breakthrough. 4-methyl pyridine, phenol, and aniline all began breaking through within one hour. The column study supported the isotherm data in the conclusion that an activated carbon column would not be an option for treating this waste stream, unless no other treatment options prove viable.

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