Mechanical Engineering Thesis Defense

Enhanced Desorption in Novel Sorbent Materials Using Ultrasound

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abstract

In this study, two novel sorbents (zeolite 4A and sodium polyacrylate) are tested to investigate if utilizing ultrasonic acoustic energy could decrease the amount of time and overall energy required to regenerate these materials for use in cooling applications. To do this, an experiment was designed employing a cartridge heater and a piezoelectric element to be simultaneously providing heat and acoustic power to a custom designed desorption bed while measuring the bed mass and sorbent temperature at various locations. To accurately measure power input to the ultrasonic transducer, the resonant frequency of the desorption bed system was empirically determined. The results prove to be promising showing that early in the desorption process ultrasound may expedite the desorption process in zeolite by as much as five times and in sodium polyacrylate as much as three times in comparison to providing heat alone. Temperature distribution results also show that utilizing ultrasound helps to more uniformly distribute heat within the bed.

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