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Developing an Electromechanical Carbon Dioxide Sensor for Occupancy Monitoring

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ABSTRACT

The Energy Information Administration reported in 2012 that heating and cooling processes consume nearly 35% of the total energy used by commercial buildings. In an effort to limit the amount of energy wasted in conditioning empty buildings and rooms, various occupancy detection techniques have been developed that can be paired with a smart heating, ventilation, and air conditioning (HVAC) control system. This work focused on the development of a novel carbon dioxide detector that is sensitive enough to accurately determine if, and when, a room is occupied. To test the new sensor design, a customized chamber with gas inlets was used to isolate the sensors in a controlled environment. The sensors were tested in this chamber alongside various commercial-off-the-shelf options for the purpose of both validating the developed sensors and observing if they exhibited increased sensitivity and selectivity over previous designs. Following these tests, the overall performance of the sensors was compared. The results of this comparison were subsequently used to assess the capabilities of the sensor designs and to identify areas for further improvement.

KEYWORDS

Sensing, Energy-efficiency, HVAC control, Vapor Sensing