Int J Waste Resour 2018, Volume 8
DOI: 10.4172/2252-5211-C1-012

8th World Congress and Expo on Recycling

June 25-26, 2018 | Berlin, Germany

Heat battery technologies for waste heat utilization for low carbon processes and automotive use

Noriyuki Kobayashi
Nagoya University, Japan

Thermochemical heat battery is one of heat management technology that shows potential for reducing waste heat and fuel consumption. The system stores a working medium utilize waste heat by repetitive heat charging and discharging operations using reversible endothermic and exothermic reactions. This material is commonly used because of its low cost, non-toxicity, and thermochemical stability. We have investigated the potential use of the $CaCl_2/H_2O$ reversible reaction. To achieve practical application of such a system, a higher volumetric power density and longer-term durability are required. Few studies have attempted to quantify the long-term durability of heat input/output performance for assessing practical application. In this study, we studied a bench scale reactor using halogenated alkaline such as $CaCl_2/H_2O$ reaction system over 1000 repetitions to quantify the long-term durability of heat input/output performance. We used a reagent anhydrous $CaCl_2$ powder with the diameter of 125-250 μm. The experimental setup consists of an evaporator, a condenser, and a reactor. Each component was connected to a thermostat bath as a heat source. A heat exchanger for reactor had 1.1 L in whole volume capacity and measured 250x200x20 mm. The pitch of the fluid flow path was 8 mm, and the pitch of the corrugated fin was 1 mm. The reactor was filled with 530 g of the anhydrous $CaCl_2$ particles. From the results for $CaCl_2$ anhydrate/dehydrate reaction system for the condition of 155°C in reactor temperature, 97°C in evaporator temperature and 30°C in condenser temperature. Discharging or charging reaction almost finished within 1200 seconds for both reaction systems. The heat discharging rate for anhydrate/dihydrate system was twice higher than that for another system due to their original reaction heat. The amount of heat discharged within 1200 seconds were 1.03 MWh/m^3-HEX for (1->2), 1.75 MWh/m_3-HEX for (0->2), respectively. Those performances were maintained for long repetitive operation over 1000 times.

kobayashi@energy.gr.jp