Development of facile property calculation model for adsorption chillers based on equilibrium adsorption cycle. MASATO YANO, KENJI HIROSE, MINORU YOSHIKAWA, NEC smart energy lablatory, THERMAL MANAGEMENT TECHNOLOGY TEAM — Facile property calculation model for adsorption chillers was developed based on equilibrium adsorption cycles. Adsorption chillers are one of promising systems that can use heat energy efficiently because adsorption chillers can generate cooling energy using relatively low temperature heat energy. Properties of adsorption chillers are determined by heat source temperatures, adsorption/desorption properties of adsorbent, and kinetics such as heat transfer rate and adsorption/desorption rate etc. In our model, dependence of adsorption chiller properties on heat source temperatures was represented using approximated equilibrium adsorption cycles instead of solving conventional time-dependent differential equations for temperature changes. In addition to equilibrium cycle calculations, we calculated time constants for temperature changes as functions of heat source temperatures, which represent differences between equilibrium cycles and real cycles that stemmed from kinetic adsorption processes. We found that the present approximated equilibrium model could calculate properties of adsorption chillers (driving energies, cooling energies, and COP etc.) under various driving conditions quickly and accurately within average errors of 6% compared to experimental data.

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