Scientific Achievement

The relationship between the pore size and topology in a series of metal-organic frameworks and its ethanol adsorption cooling capability was studied experimentally and computationally: the optimal pore sizes of the MOF adsorbents were found to be \( \sim 1.5 \) nm for ice-making, \( \sim 2 \) nm for refrigeration, and \( 3-4 \) nm for a heat pump.

Significance and Impact

The adsorption of ethanol onto MOFs is an environmentally friendly alternative to traditional refrigerants: the strategy developed here can also be combined with the pore-engineering approach to establish structure–property relationships and search for high performance adsorbent materials for cooling.

Research Details

MOF-525, PCN-223, NU-1000, NU-901, PCN-222-Fe and NU902 were studied.

- PXRD and SEM techniques were used to confirm synthesis; subsequently, ethanol sorption was measured.
- All adsorption isotherms were simulated using the grand canonical Monte Carlo (GCMC) method in the RASPA software package.