On the Thermal Stability of Zeolitic Imidazolate Framework-8 (ZIF-8)

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Zeolitic imidazolate frameworks (ZIFs) provide flexible change in their pore size via the various selection of ligands and atoms and show high thermal/chemical stabilities due to the strong interaction between the components. Therefore, ZIFs have been used in many applications; membranes, adsorptions, fillers in composite membranes, sensors, etc. Among them, ZIF-8s (0.34 nm) were shown to serve as good membrane materials for reliable H2(0.289 nm)/CO2(0.33 nm) separations. Considering the fact that operating conditions for H2/CO2 separations often require harsh conditions (high temperature, high pressure, etc.), understanding of the thermal stability of ZIF-8s is crucial for the reliable applications. Nevertheless, to be best of our knowledge, there has been no systematic study on the thermal stability of ZIF-8s. Here, we focus on the thermal stability of ZIF-8 by varying heat treatment temperatures and the surrounding environment. We found that the phase transition of ZIF-8s through a unknown, intermediate phase eventually to the zinc oxide phase as temperature increased, though under the inert environment, ZIF-8s showed a good thermal stability up to ~500 °C.