

processable MOF membranes, which has been challenging. A team led by Jared B. DeCoste of the Edgewood Chemical Biological Center at Aberdeen Proving Ground and Seth M. Cohen of the University of California, San Diego, reports success in making robust poly(vinylidene difluoride)-HKUST-1 membranes (*Chem. Sci.* 2016, DOI: 10.1039/c5sc04368a). HKUST-1 is a copper-based MOF, in which paddle-wheel Cu dimers are linked by benzene-1,3,5-tricarboxylate units. High levels of humidity decompose powdered forms of HKUST-1, lowering gas-uptake capacity. In contrast, HKUST-1-polymer membranes retained their mechanical stability and theoretical ammonia capacities even after a monthlong exposure to 90% relative humidity.—MJ

NANOPARTICLES TRACK KIDNEY DISEASE

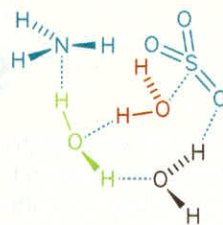
Kidney disease is known as a silent killer. That's because the markers physicians look for to diagnose the disease, such as urea and creatinine levels in the blood, often appear normal even when up to 75% of kidney function has been lost. One inexpensive, noninvasive method for imaging kidneys is to use near-infrared fluorescence imaging to follow an organic dye as it travels through the organs. But such dyes have problems: They often don't provide enough contrast in the kidney, and they accumulate in background tissues. Researchers led by Jie Zheng of the University of Texas, Dallas, previously reported that glutathione-coated gold nanoparticles work better than the dyes as fluorescence imaging agents for cancer detection. The nanoparticles, Zheng notes, are inexpensive and clear the body easily. Now Zheng's lab has shown that the nanoparticles can differentiate between various stages of kidney dysfunction in a mouse model (*Angew. Chem. Int. Ed.* 2016, DOI: 10.1002/anie.201511148). If the results translate to people, doctors would be able to easily tell the difference among kidneys with normal function, mild dysfunction, and severe dysfunction—something they're currently unable to do.—BH

WATER HELPS FORM SULFATE SALT IN AIR

Sulfate salts in the atmosphere play a critical role in nucleating and enlarging

aerosol particles, which can seed precipitation, reflect or absorb solar radiation, and harm health. But the mechanisms behind the formation of salts such as ammonium sulfate have yet to be fully detailed. Computational work now indicates that ammonium bisulfate can form from the pollutants ammonia and sulfur trioxide, mediated by water (*J. Am. Chem. Soc.* 2016, DOI: 10.1021/jacs.5b13048).

NH_3 is emitted by agricultural operations and SO_3 by fossil-fuel burning. A team at the University of Nebraska, Lincoln, led by Joseph S. Francisco and Xiao Cheng Zeng found that water molecules from a water trimer or droplet form a looplike network connecting NH_3 and SO_3 molecules. The network facilitates water-mediated proton transfer in which one water breaks apart, giving OH^- to SO_3 to form HSO_4^- and an H^+ to another water. The water that receives the H^+ transfers one of its original H^+ ions to NH_3 to form NH_4^+ . The reaction has a low barrier and consequently may play a significant role in the formation of aerosol particles.—JK



In a proposed mechanism for atmospheric NH_4HSO_4 formation, one H_2O (red) breaks apart to give OH^- to SO_3 and H^+ to another H_2O (green). The H_2O that receives the H^+ transfers one of its original H^+ ions to NH_3 to form NH_4^+ .

leagues proposed this reaction pathway, noting that methanol is more reactive than methane. Methane, which exists in giant clouds in the interstellar medium, has long been presumed to be the starting block for the formation of more complex interstellar hydrocarbons. However, over the past two decades, astronomers have discovered interstellar clouds containing methanol as well. Olah's group, citing results of their experiments and computations involving methanol carried out over the years, points out numerous ways in which methanol chemistry can lead to hydrocarbon production. For example, when methanol is exposed to intense radiation such as that in outer space, hydrocarbons can be formed through oligomerization of an intermediate, ethylene.—EKW

NANOCATALYSTS REVEAL STRUCTURE SENSITIVITY

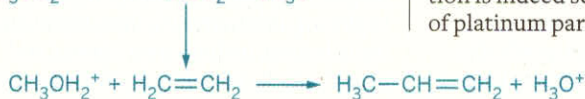
A combined molecular-beam and quantum-simulation study that explores the catalytic behavior of tiny platinum clusters calls into question a well-established precept regarding the influence of structure on the reactivity of solid catalysts (*Nat. Commun.* 2016, DOI: 10.1038/ncomms10389). Years of experiments have shown that platinum-catalyzed hydrogenation of ethylene to ethane does not depend on the surface structure of the platinum crystallites. This archetypal "structure-insensitive" reaction has long stood in contrast to structure-sensitive reactions, for example, ammonia synthesis on iron crystals. These classifications have influenced strategies for enhancing catalyst performance. Now, a team led by Ueli Heiz of the Technical University of Munich and Uzi Landman of Georgia Tech has shown that ethylene hydrogenation is indeed sensitive to the structure of platinum particles, if those particles

lie at the low end of the nanoscale regime. By studying size-selected platinum clusters com-

posed of nine to 13 atoms, they found that the nine-atom cluster does not catalyze ethylene hydrogenation but the larger particles do catalyze the reaction with activity that increases with cluster size. Calculations show how the number of atoms dictates cluster geometry, which controls the clusters' electronic properties underpinning surface catalysis.—MJ

METHANOL REACTIONS IN SPACE

The radiation-induced conversion of methanol may be an important path-



Interstellar radiation can set off methanol's conversion to hydrocarbons.

way for the production of hydrocarbons in the interstellar environment, according to a new study (*J. Am. Chem. Soc.* 2016, DOI: 10.1021/jacs.6b00343). University of Southern California chemistry professor George A. Olah, who won the 1994 Nobel Prize in Chemistry, and col-