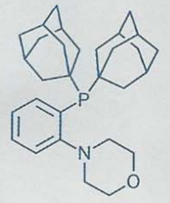
P,N LIGAND ADVANCES AMMONIA COUPLING

Palladium-catalyzed cross-coupling of aryl halides and amines, known as Buchwald-Hartwig amination, is a key tool for constructing arylamines in organic synthesis. In the latest twist on this reaction, Mark Stradiotto and coworkers at Dalhousie University, in Halifax, Nova Scotia, report a new ligand that enables chemists to selectively react ammonia—the simplest and most abundant N–H source—with a broad range of aryl halides and tosylates at room temperature (*Angew. Chem. Int. Ed.*, DOI: 10.1002/anie.201000526). The chelating P,N ligand, which the team calls Mor-DalPhos, consists of an adamantyl-substituted phosphorus and a morpholine-substituted nitrogen bridged by phenylene. The team previously prepared a dimethyl version of the ligand, called Me-DalPhos, which is handy for traditional amine couplings (*Chem. Eur. J.* **2010,** *16,* 1983). Both Mor-DalPhos and Me-DalPhos are in demand by pharmaceutical companies, Stradiotto says. His group has made batches of the ligands that are already being sold by Strem Chemicals. The reactivity and selectivity of Mor-DalPhos with ammonia at room temperature "is remarkable," says John F. Hartwig of the University of Illinois, Urbana-Champaign. Stradiotto's group has found a ligand "sweet spot" for C–N coupling between tightly bound bidentate bisphosphines and labile hindered monodentate phosphines, Hartwig notes.—SR



Mor-DalPhos

DENSITY ANALYSIS BY MAGNETIC LEVITATION

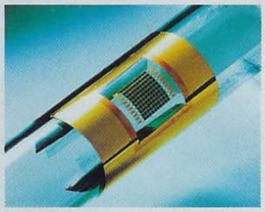
Using the magic of magnetic levitation, Harvard University chemists have devised a simple, inexpensive, and portable tool for food and water analysis based on density (*J. Agric. Food Chem.*, DOI: 10.1021/jf100377n). Magnetic levitation, or MagLev, uses magnetic fields to suspend objects. The phenomenon can be applied to measure density and estimate chemical composition on the basis of differences in density. Katherine A. Mirica, Scott T. Phillips, Charles R. Mace, and George M. Whitesides designed a MagLev device that consists of a vial containing a paramagnetic fluid—$GdCl_3$, for example—between two NdFeB magnets. By suspending a diamagnetic object or droplet of sample fluid in the paramagnetic solution, the researchers were able to estimate the salinity of water; distinguish different plant oils according to their content of polyunsaturated and monounsaturated fats; determine fat content in milk, cheese, and peanut butter; and compare a variety of grains. "Potential applications of MagLev may include evaluating the suitability of water for drinking or irrigation, assessing the content of fat in foods and beverages, or monitoring processing of grains," the researchers note.—BH

J. AGRIC. FOOD CHEM.

Droplets of whole (left) and skim (right) milk undergo MagLev analysis.

SEMICONDUCTOR STACKS

A new method for growing large, high-quality pieces of compound semiconductors such as gallium arsenide could help boost the use of these materials in photovoltaic and optoelectronic devices (*Nature* **2010,** *465,* 329). Compound semiconductors easily outperform silicon semiconductors, thanks to their direct band gaps and high electron mobilities. But growing large, high-quality wafers of GaAs and related materials has proven costly. To address this problem, a team led by John A. Rogers of the University of Illinois, Urbana-Champaign; Ungyu Paik of Hanyang University, in South Korea; and Matthew Meitl of photovoltaics developer Semprius, in Durham, N.C., developed a fabrication method in which multiple layers of GaAs or AlGaAs are grown via metal organic chemical vapor deposition in between separating layers of AlAs. Immersing this stack in hydrofluoric acid dissolves the AlAs, releasing pieces of the semiconductor material in sizes that range from micrometers to centimeters and in thicknesses that range from nanometers to micrometers. To show the capabilities of the method, the researchers used it to create GaAs-based field-effect transistors and logic gates on glass plates, near-infrared imaging devices on silicon wafers, and photovoltaic modules on plastic sheets.—BH



JOHN ROGERS

A photovoltaic module (4 mm) containing an array of GaAs solar cells on a plastic sheet.

RAPID WATER-ION DYNAMICS REVEALED

New spectroscopic techniques are providing some of the most detailed pictures yet of the behavior of water molecules on femtosecond timescales (*Science* **2010,** *328,* 1003 and 1006). Ubiquitous liquid water, with its networks of evanescent hydrogen bonds and its vital interactions with biological and atmospheric molecules and ions, remains mysterious. In one study, Minbiao Ji of the SLAC National Accelerator Laboratory and colleagues used two-dimensional infrared spectroscopy to verify a recent prediction that when water molecules and perchlorate ions (ClO_4^-) exchange hydrogen bonds, the water molecules rotate in quick jumps rather than in smooth motions. In a separate study, Klaas-Jan Tielrooij and colleagues at the Institute for Atomic & Molecular Physics, in Amsterdam, employed terahertz dielectric relaxation spectroscopy and femtosecond

In this representation, a hydrated cation (green) and hydrated anion (blue) trap the hydrogen-bonded network of water molecules that exists between them.