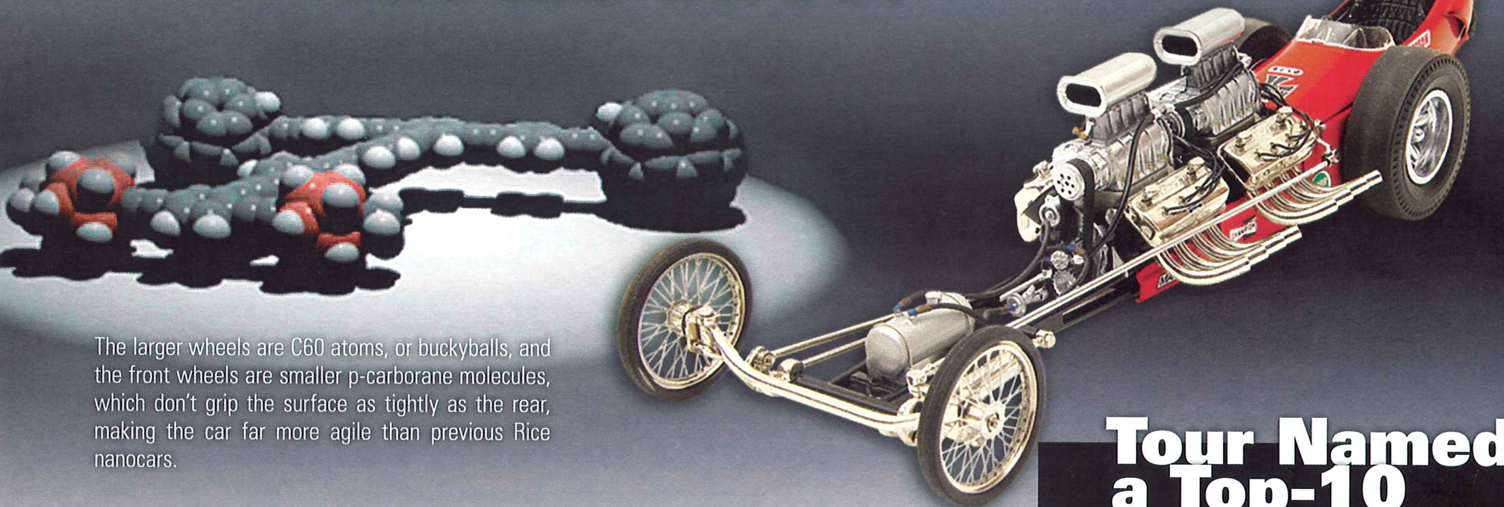
Nanodragsters Hit the Street



The larger wheels are C60 atoms, or buckyballs, and the front wheels are smaller p-carborane molecules, which don't grip the surface as tightly as the rear, making the car far more agile than previous Rice nanocars.

You could call James Tour the CEO of America's smallest automobile manufacturer. Since 2005, Tour — the T.T. and W.F. Chao Professor of Chemistry, professor of mechanical engineering and materials science, and professor of computer science — has created a series of molecular machines that resemble cars and trucks on America's streets. Now, Tour and Kevin Kelly, associate professor in electrical and computer engineering, have revealed their latest breakthrough: the nanodragster.

The nanodragster, named for its characteristic hot-rod shape, with small wheels on a short axle in the front and large wheels on a long axle in the back, is another step toward functional nanomachines that can be custom-built and set to work in microelectronics and other applications.

The composition of those wheels is important. Early nanocars rolled on simple carbon 60 molecules (buckyballs). But they were a drag, literally, as they would only turn on a gold surface in high heat, about 200 degrees Celsius. The key to better mobility was putting wheels of p-carborane — a cluster of carbon and boron atoms, which operate at much lower temperatures — in the front and buckyballs in the back for greater traction. The result is a vehicle that can operate at a much lower temperature than previous models.

The tiny hot rod, 1/25,000th the width of a human hair, has a chassis that rotates freely and allows the car to turn when one front wheel or the other is lifted, a behavior not seen in previous nanocars. Much to the researchers' amusement, in several of the images the nanodragsters appear to be "popping wheelies" with both front wheels raised off the surface, just like real dragsters at the start of a race. Obtaining greater control of their motion and giving them the ability to operate on surfaces other than gold are subjects of ongoing research.

Guillaume Vives, a former postdoctoral research associate in Tour's lab, and JungHo Kang, a graduate student in the Department of Electrical and Computer Engineering, co-authored the research paper, which was reported in the American Chemical Society journal Organic Letters. ■

—Mike Williams

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Tour Named a Top-10 Chemist

James Tour, the Rice researcher behind a dealershipful of nanoscale vehicles, advances in molecular electronics, nanoparticles for oil extraction, a Web site to facilitate advances in pharmaceutical synthesis and even video games to teach scientific concepts to children, has been named one of the world's top 10 chemists for the past decade.

The accolade comes from Times Higher Education, a United Kingdom publication for professionals in education and research, which judged the researchers on the number of papers published in journals from January 1999 to June 2009 and, critically, the number of citations per paper. Tour published 135 papers in that time, with an average of 62.76 citations per paper. ■

—Mike Williams