Carbon-rich molecules 'supersized' for the first time

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A University of Oregon chemist has "supersized" carbon-rich molecules, enabling researchers for the first time to test theories about the useful properties of synthetic forms of carbon. The discovery by Mike Haley will be published as the cover story in the Dec. 9 edition of the *Journal of Organic Chemistry* (JOC). The story will be posted on the JOC website today (Dec. 2).

Scientists have long predicted that unnatural forms of carbon could have many technologically useful properties, much like those found for the natural phases of carbon, which are graphite and diamond. Haley's research seeks to prove those predictions are true and to do so, the new carbon materials must be of sufficient size to observe their properties.

"'Supersizing' fragments of unnatural carbon has enormous implications for determining future applications because certain properties can only be realized at much larger dimensions," said Haley. At a diameter of five to six nanometers (a nanometer is a billionth of a meter) the new disk-shaped molecules are more than twice the size of the one-to-two nanometer pieces previously developed by Haley's team. For instance, Haley explains that molecules of polystyrene used for Styrofoam cups are rigid because of their large size. At much smaller molecule sizes, however, the same material is a viscous liquid. "Size is important," he said.

Haley and doctoral student Jeremiah Marsden were able to produce several different supersized molecules by using acetylene subunits to link

benzene anchors to form the giant networks. The expanded molecules have a high density of pi-electrons that are extremely useful for electronics and optics. Haley said the most promising application for the new material is in optical electronics and, specifically, switches used in telecommunications. Haley's group is collaborating with researchers at the University of Michigan to test the strength, reliability, and durability of the new material.

Mike Haley is a professor of chemistry and a member of the university's Materials Science Institute. His research was funded by a grant from the National Science Foundation.

Source: University of Oregon