

Aug. 31, 2004

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MU Researcher Breaks New Ground in Understanding Chemical Reaction Process

Study of Diazonium Rewrites Texts, Aids Cancer Research

COLUMBIA, Mo. – For the past 40 years, chemistry textbook authors have written about a common, basic chemical process using diazonium ions as the example. These ions are used in a variety of applications, including dyes, but also represent a basic chemical molecular structure found in nature. Now, a University of Missouri-Columbia researcher has found that this chemical process has been incorrectly described. The research will not only change what is common knowledge in basic chemistry, it will also play a role in cancer research.

MU chemistry professor Rainer Glaser and graduate student Zhengyu Wu have found and proven that the process called “diazonium ion hydrolysis,” in which water replaces nitrogen in the diazonium ion, is actually a one-step process. Previously, chemists believed the same procedure required two elemental steps to achieve the same result. While it is basic chemistry, what Glaser calls the “poster boy of physical organic chemistry,” the change will have a major impact on the way chemists view this nucleophilic substitution process and their work. The findings are published the current issue of *Journal of the American Chemical Society*.

“I’ve thought about it for 20 years and always felt there was something wrong with it,” Glaser said. “Now it makes sense and there’s not one experiment I cannot explain with this new mechanism. This will be common knowledge for chemists and very influential because we will just know better how the reactions occur.”

Glaser says the research helps illustrate what happens to DNA when it is damaged by nitrosation, a process in which an amine, a derivative of ammonia, reacts with nitric oxide or nitrous acid. Nitrosation leads to the formation of diazonium ions of the molecules that are parts of the DNA polymer. Nitrosation deamination also causes some known cross-link formations, where two DNA strands are permanently connected and the strands are no longer able to unwind, thus preventing the reading of normal cell function. Once the DNA is damaged in this or other ways, the cell malfunctions. One possible malfunction is for the cell to turn into a cancer cell.

“Our work suggests that there might be other cross-links that have not yet been discovered,” Glaser said. “By knowing what happens to DNA, we can learn how it can be damaged. Once you know that, it’s the first step in finding how to fix it.”

Glaser’s research is funded by the National Institutes of Health.