Carnegie Mellon

Department of Media Relations
Carnegie Mellon University
Bramer House
Pittsburgh, PA 15213
412-268-2900
Fax: 412-268-6827

Contact: Lauren Ward
412-268-7761

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Fe-TAML® Activators Developed at Carnegie Mellon Decolorize Textile Mill Wastewater

NEW YORK—Powerful, environmentally friendly catalysts called Fe-TAML® activators, developed by scientists at Carnegie Mellon University, significantly decolorize dyes found in wastewater released from textile mills and are highly promising for clearing this polluted water.

The results of extensive field trials of this decolorization will be reported by a team of Carnegie Mellon investigators on Wednesday, Sept. 10, in New York City at the 226th annual meeting of the American Chemical Society (paper 174, "Application of a peroxide-based AOP for removal of dyes from textile dyeing mill wastewaters," Industrial & Engineering Chemistry Division).

"Our field tests show that Fe-TAML activators with hydrogen peroxide are highly promising for clearing water polluted with textile mill dyes," said Colin Horwitz, a research associate professor at Carnegie Mellon who is presenting the results. As part of his talk, Horwitz also will present results of laboratory experiments showing that the Fe-TAML activators are useful in decolorizing a wide range of industrial dyes.

Each year, approximately 53 billion gallons of wastewater released by textile manufacturing mills need to be treated to remove color.

Fe-TAMLs (TAML stands for tetra-amido macrocyclic ligand), which are synthetic catalysts made with elements found in nature, offer a potent, safe and cost-effective means of rapidly purifying dye-laden effluent. Current technologies to remove dyes are costly, and large volumes of water are needed to clear the dye from wastewater treatment areas.

In their field tests, Horwitz and fellow investigators used minuscule amount of one Fe-TAML activator (10^{-6} M concentration) and small amount of hydrogen peroxide (10^{-3} M concentration) to treat spent dye bath solutions found immediately after the dyeing operation and to treat dyes remaining in a biological treatment pond.

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Using Fe-TAML activators, textile mills could increase the amount of dye removed from effluent, according to Horwitz, who added that employing Fe-TAML activators could enable manufacturers to recycle water used in textile dyeing. This step would reduce overall plant costs and save millions of gallons of water yearly over the entire industry. Theoretically, sunlight would also penetrate Fe-TAML-treated water much more easily than dyed water, thereby improving the survival of aquatic fish and plants.

Fe-TAML activators originated at Carnegie Mellon's Institute for Green Oxidation Chemistry under the leadership of Terry Collins, the Thomas Lord Professor of Chemistry at the Mellon College of Science. Collins is a strong proponent of green chemistry to create environmentally friendly, sustainable technologies. Fe-TAML activators show enormous potential to provide clean, safe alternatives to existing industrial practices. They also provide ways to remediate other pressing problems that currently lack solutions. The dye decolorization research was supported in part by the Eden Hall Foundation of Pittsburgh.

As part of this September's American Chemical Society meeting symposium, "Green Chemistry: Multidisciplinary Science and Engineering Applied to Global Environmental Issues," the Collins' group will present results of Fe-TAML activators' effectiveness in killing a simulant of a biological warfare agent, reducing fuel pollutants, treating pulp and paper processing byproducts, and de-toxifying pesticides. At the symposium, the Collins group also will highlight how Fe-TAML activators can work with oxygen rather than hydrogen peroxide, thereby extending tremendously the range of potential applications of these catalysts.

Note to Reporters:

For more details about Fe-TAML activators, please visit www.chem.cmu.edu/groups/collins. A full set of press materials, including backgrounders on Fe-TAML activators and the Institute for Green Oxidation Chemistry, is available by contacting Lauren Ward (email: wardle@andrew.cmu.edu; cell phone: 412-913-0175; office phone 412-268-7761). She also can provide names and contact information for outside experts familiar with the Fe-TAML technology. Press materials will be available online to the public at 5 p.m. Sept. 10 on the Mellon College of Science Web site (http://cmu.edu/mcs).

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