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Small Wonders

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As environmental challenges grow, one chemist has been looking to smaller solutions.

Kenneth J. Klabunde, university distinguished professor of chemistry at Kansas State University, has spent more than 35 years fusing his expertise in nanotechnology and chemistry into materials that help maintain a cleaner and safer environment. His research has positioned him as an international leader in energy and environmental issues, and has led to mentoring many of the next generation of environmentally conscious scientists.

“I realized a long time ago that we must develop cleaner technologies without significant loss in our standard of living,” Klabunde said about his efforts.

In the 1980s, Klabunde began working with oil companies on creating cleaner fuel using nanotechnology and catalysts.

His research led to FAST-ACT, an environmentally safe nanopowder that detoxifies chemical and biological hazards. The powder is porous and has a high surface area, allowing it to trap toxins and odors in a lattice-like structure and break the chemical bonds that form the pollutant. Consumers include the military, used and rental car dealerships, as well as homes and business with odor problems or toxins.

“Chemistry is at the heart of most advanced technologies,” Klabunde said. “So, chemistry must also be the foundation for creating a cleaner and safer environment.”
By Greg Tammen, Communications and Marketing

Removing the smell of fresh paint or new carpet in a room may eventually be a matter of turning the lights on or off.

Manindu Peiris, a May 2012 doctoral graduate in chemistry who studied under Klabunde, looked at materials that use light and darkness to purify toxins in the air. Her research could lead to new air filters, humidifiers and other devices that could detoxify windowless rooms, manufacturing facilities and other indoor areas.

Peiris tested and analyzed photocatalysts and dark catalysts — materials made by chemically bonding metal to oxygen. Photocatalysts react to light while dark catalysts react to darkness. Exposing the catalysts to either light or darkness triggered a chemical reaction that converted the air pollutants into smaller, nonharmful levels of carbon dioxide over time.

Yen-Ting Kuo, a fall 2011 doctoral graduate in chemistry who studied under Klabunde, helped develop an emerging method of harvesting sunlight to produce fuel.

Kuo’s research looked at improving metal-oxide photocatalysts’ ability to react with light. Improved reactions result in better chemical reaction performance.

Producing solar fuel involves channeling sunlight into a tank of water containing photocatalysts. The light triggers a series of chemical reactions that produce a synthetic gas called syngas. Syngas can power internal combustion engines and can also be used to create synthetic petroleum fuels.

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