

## **News Wire from Idaho National Engineering and Environmental Laboratory – Home of Science and Engineering Solutions**

**Welcome!** This is a special feature edition of the **INEEL News Wire**, which delivers news about current advances in research and technology at the multiprogram Department of Energy's Idaho National Engineering and Environmental Laboratory (INEEL), located in Idaho Falls, Idaho.

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### **INEEL researches safer, 'greener' gasoline production**

By John Howze (*jhowze@inel.gov*)

"Fill 'er up" is what most Americans know about their cars.

But researchers at the U.S. Department of Energy's Idaho National Engineering and Environmental Laboratory (INEEL) are seeking much deeper knowledge as they strive to make gasoline production "greener and cleaner."

Chemical engineer Lucia Petkovic (Lu-see-a Pet-ko-vich), Ph.D., from Argentina, is one of INEEL's newest postdoctoral fellows. In conjunction with the laboratory's Supercritical Fluids Group, she is working to understand the mysteries of a chemical reaction that could make gasoline production safer.

The reaction Petkovic is studying uses a solid acid catalyst – rather than dangerous liquid acids -- to produce gasoline from petroleum products.

"I want to produce a picture of the chemical reaction mechanism that rejuvenates the catalyst surface," Petkovic said.

INEEL chemical engineer Dan Ginosar, Ph.D., heads the research group.

“We’re hoping Lucia will have a good experience,” Ginosar said. “We want her to have an opportunity to learn, to publish, and to be fruitful for the INEEL technical community.”

### **Preventing harm to people and the planet**

Oil refineries use liquid acids as catalysts to produce isooctane, the eight-carbon chain you might know best as the “octane” number on the gas pump. The acids can be dangerous to handle, and because they are so concentrated, if spilled can do environmental harm.

INEEL scientists have developed a method that uses a much safer solid acid catalyst to do the same thing. The acid is a part of the surface of man-made pellets called zeolite catalysts. Using such a substance would reduce the chance of a person or the environment being harmed by a concentrated acid.

The catalyst works well, but over time the catalyst surface can “gum up” with unwanted byproducts. A supercritical fluid (a gas which becomes a fluid under pressure) can restore the catalyst activity – but a deeper understanding of the regeneration chemistry is desired.

Petkovic’s challenge is pure science – to explain exactly how molecular interactions cleanse the catalytic medium.

### **Education and economics**

Growing up, Petkovic loved science and chose it as a career. Her native Argentina has had some tough economic times, so she took the educational route that offered the most employment possibilities.

“As a chemical engineer, I could work either as a teacher or in industry,” she said, “but with a degree in chemistry education I could only work as a teacher. So I chose to become a chemical engineer.”

Petkovic came to America to study at the University of Nebraska. Five years later, she returned to Argentina and university teaching with her Ph.D.

Meanwhile, Ginosar faced an unusual technical problem.

The INEEL’s new catalyst regeneration process showed great potential – it currently is nominated for an R&D 100 Award and later this year the team will know if it won – but a deeper understanding of the rejuvenation process is needed. This knowledge is important in the development of a safer petroleum refining process.

Not knowing exactly how he would find just the right researcher, Ginosar contacted more than 50 university chemistry and chemical engineering departments across the nation.

That was the easy part.

### **A Sense of belonging and teamwork**

Washington State University, an INEEL Inland Northwest Research Alliance (INRA) partner, oversees the hiring process for all Laboratory postdoctoral fellows. The INRA involvement strengthens the education and research collaborations between INEEL and the academic community.

Petkovic submitted her resume.

Four months later, she arrived to begin her fellowship. She has been here barely two months. Already she likes it.

She has expert help at the INEEL. As she takes the lead on this research, a team of talented engineers and scientists supports her, and world-class scientific equipment and software also are at her disposal.

That makes her optimistic she can solve the question of what happens on the catalyst surface.

And when she does, people everywhere might “fill ‘er up” with gasoline produced in a “greener and cleaner” way.

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