New molecules to reduce cost, environmental impact of mining precious metals

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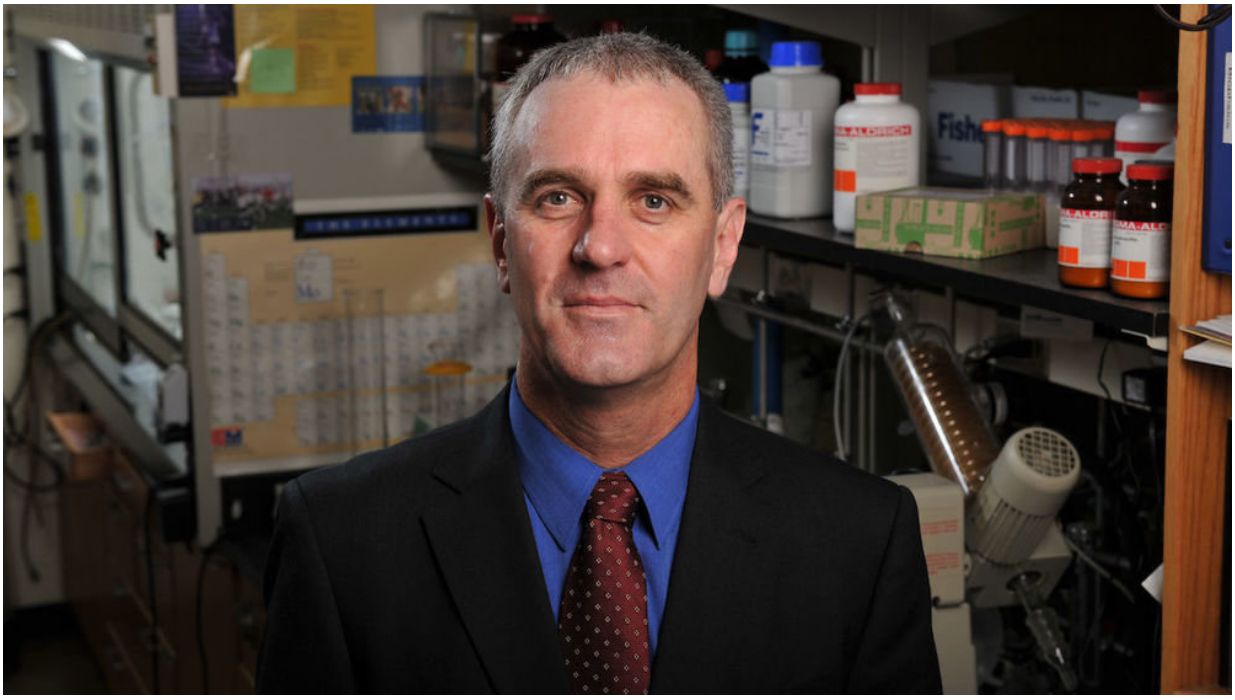

Credit: University of Notre Dame

Researchers at the University of Notre Dame have invented a new class of molecules that can be used to simplify the process used for capturing precious metals including gold, platinum and palladium.

The study, which was published in the *Journal of the American Chemical Society*, shows how these newly developed molecules were created with a

particular shape and size that enable them to capture and contain precious metal ions. This unique molecular recognition property can be exploited for multiple applications – the most notable of which is gold mining.

"Currently, most of the world's gold mining relies on a 125-year-old method that treats gold-containing ore with large quantities of poisonous sodium cyanide, which is extremely dangerous for mine workers and can cause environmental issues," said Bradley D. Smith, Emil T. Hofman Professor of Chemistry and Biochemistry, senior author of the study and the director of the Notre Dame Integrated Imaging Facility. "The new container molecules that our research team created are expected to be very useful for mining gold since they can be used in an alternative process under milder conditions."

This alternative mining method converts the gold-containing ore into chloroauric acid and extracts it using an industrial solvent. The container molecules are able to selectively separate the gold from the solvent without the use of water stripping, which is economically and environmentally costly.

"Our newly developed molecules have the ability to eliminate this need for water stripping and facilitates solvent recycling in this alternative mining process," said Smith.

In addition to their use for gold mining, these container molecules could also be applied to "urban mining," which includes processes that remove precious metals from urban wastewater streams.

More information: Wenqi Liu et al. Macrocyclic Receptor for Precious Gold, Platinum, or Palladium Coordination Complexes, *Journal of the American Chemical Society* (2018). DOI: 10.1021/jacs.8b04155

Provided by University of Notre Dame