Chemical engineer patents enzymatic preparation to make natural ingredients in the lab

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A Kansas State University chemical engineer has developed and patented a chemical structure to make all-natural personal care products and purer pharmaceuticals in the laboratory.

K-State's Peter Pfromm, in collaboration with visiting scientist Kerstin Wurges, has engineered a way to use enzymes to efficiently catalyze chemical reactions to create things like scents for perfumes or to avoid the introduction of inactive ingredients in drugs.

The process - scientifically referred to as a lyophilizate of an enzyme and fumed silica - is essentially an enzyme-covered nanoparticle of fumed silica.

Traditionally, to add the scent of rose to a perfume or lotion, the rose was grown and then its scent compound was extracted through careful processing. Over the years chemists have devised ways to produce these quite valuable scent compounds in the lab in mass quantities. By law, however, compounds resulting from a purely chemical process are not considered natural.

Pfromm's method uses enzymes to catalyze the reactions needed. Since enzymes come from natural organisms, the end product can be billed as natural. Also, no potentially harmful residues will be present in the end product, as may be the case with chemical catalysts.

"That enzyme will do the job of making that rose scent out of two chemicals," Pfromm said. "Since the enzyme is derived from an organism, you end up with a product that is just as trustworthy as if you had taken a whole plant and extracted that molecule from it."

In addition, the ability to make mass quantities in a reliable fashion isn't lost.

"You can make the product much faster, in much larger amounts and at lower cost — and it's exactly the same molecule made by the plant," Pfromm said. "You also then can say on the packaging that the product is natural."

Enzymes also can be used to make a purer form of pharmaceuticals.

Pfromm said that the active molecules in many drugs often come with an inactive twin that can be expensive and difficult to chemically separate. However, enzymes are very effective at only producing the active version of the molecule.

"Most of the time the inactive twin molecule is harmless, but there is a trend toward making more pure pharmaceuticals," Pfromm said. "Enzymes are exceedingly good at taking reactants and making them into only one of the versions, not both. They are supremely selective in this way; chemical catalysts are not."

The nanoparticle support is critical to the success, Pfromm said. Enzymes naturally work best in water, but the processes used to produce such compounds generally take place in some organic solvent. Though enzymes work in these solvents, they can easily clump, making enzymes inside of the tight clumps that are essentially wasted.

Using an electrostatic process to coat the fumed silica nanoparticles with

the enzyme exposes the maximum number of enzymes to the reaction mixture. This maximizes the amount of end product made and makes more efficient use of all of the enzymes.

Fumed silica also is very cheap and is widely used in consumer products, including food, so any minute residues that may be left in the final product would be considered safe for drugs, foods or skin care.

Pfromm already has fielded some interest from commercial entities.

More information: More information is available at www.k-state.edu/tech.transfer/ … hnologies/04-11.html

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