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Section of Public Relations	Dongsun Cho Section Chief 062-715-2061	Nayeong Lee Senior Administrator 062-715-2062
Contact Person for this Article	School of Materials Science and Engineering Professor Inchan Kwon 062-715-2312	
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Professors Inchan Kwon and Giyoong Tae's joint research team develops an all-in-one eco-friendly nanoreactor that continuously manufactures drugs

- GIST (Gwangju Institute of Science and Technology) School of Materials Science and Engineering joint research team of Professor Inchan Kwon and Professor Giyoong Tae developed an eco-friendly nanoreactor* that can repeatedly produce useful drugs without additional supply of eco-friendly biocatalysts and cofactors.

  - The research team confirmed that alginate, which is a biocatalyst combining two types of redox enzymes and cofactors**, can be simultaneously captured in nanoparticles to create desired compounds while simultaneously reusing cofactors.

* nanoreactor: inserting nanoparticles into cells or living bodies and inducing artificial chemical reactions that do not occur *in vivo*

** cofactor: organic compounds or metal ions that help electron transfers necessary for the activity of redox enzymes

- Recently, as interest in the development of eco-friendly manufacturing processes has increased, manufacturing processes using enzymes, a safe biocatalyst that can be obtained from nature, are in the spotlight. In particular, redox enzymes

that promote redox reactions play a central role in environmentally friendly preparation of compounds with high added value.

- However, due to the high cost of enzymes, many studies have been conducted to capture it in a specific carrier and use it for a long time. Many types of redox enzymes consume electron transporters called cofactors, and these cofactors are also expensive, making it a big stumbling block for the development of compound production processes using redox enzymes. In addition, the size of cofactors is small, which makes them difficult to capture with existing carriers, which is another limitation for long-term use.

□ To improve the recyclability of cofactors, the research team increased the size by combining two types of redox enzymes that can recycle cofactors with alginic acid, a polymer obtained in nature, and designed a nanoreactor that can reuse enzymes and cofactors by trapping them in polymer nanoparticles by simple methods such as temperature control.

- The nanoreactor developed by the research team was confirmed to repeatedly produce D-mannitol, a drug that reduces intraocular pressure and brain pressure, without additional supply of enzymes and cofactors. In addition, it can be used to make various drugs.

□ Professor Inchan Kwon said, "Nanoreactors in which enzymes and cofactors are captured simultaneously is a platform technology that can be used to prepare a variety of compounds, including drugs. As a typical eco-friendly technology, these nanoreactors are expected to contribute to the development of a new carbon resource/carbon-neutral process that converts by-product gases or greenhouse gases into useful compounds through recycling of cofactors."

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