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Professor Sukwon Hong's research team uses light to convert carbon dioxide into non-natural amino acids

□ GIST (Gwangju Institute of Science and Technology) Department of Chemistry Professor Sukwon Hong's research team developed a technology that converts carbon dioxide into non-natural gamma-amino acid*, a high value-added substance, in an environmentally friendly way using light energy.

* gamma-amino acid: a major inhibitory neurotransmitter in the brain that is used as a pharmaceutical substance

◦ The research team succeeded in synthesizing carbon dioxide, a greenhouse gas, into a non-natural gamma-amino acid used as a core raw material for medicines and health foods. It is mainly used as a treatment for central nervous system diseases such as Parkinson's and Huntington's disease. It is also expected to be used in technology for recycling sustainable carbon sources.

□ Non-natural gamma-amino acids are used as pharmaceutical substances with physiological activity, but they do not exist in nature, so they can be obtained only through synthesis. There are various methods for synthesizing non-natural gamma=amino acids, but there are disadvantages in that it is a multi-step reaction or has relatively high toxicity and waste.

- Non-natural gamma-amino acids used as treatments for central nervous system disorders are characterized by the presence of various types of functional groups at specific positions. Introducing a functional group at a specific position of a non-natural gamma-amino acid by a synthetic method using carbon dioxide is difficult and very challenging with the conventional technology.

□ The research team succeeded in selectively obtaining non-natural gamma amino acids with a maximum yield of 96% by dual functionalization* carbon dioxide and amines in allene**, which is an organic substance with potential, using an iridium catalyst capable of light sensitivity***.

* dual functionalization: a reaction that introduces two functional groups at once
** allene: a hydrocarbon compound with a unique form of unsaturation
*** light sensitivity: activated by absorbing light

□ Professor Sukwon Hong said, "The synthesized non-natural gamma-amino acid is a previously unknown substance, and the possibility of it being used as a material for the treatment of various kinds of central nervous system disorders through additional treatment is endless. It is significant in that it is possible to convert carbon dioxide, a greenhouse gas, into a drug candidate by using visible light."

□ This research was led by Professor Sukwon Hong and conducted by Ph.D. student Hyungwoo Hahm with support from the National Research Foundation of Korea and was published online on April 29, 2021, as the cover of *Organic Letters*, which is a top 7% journal in the field of organic chemistry.

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