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Professor Bong-Joong Kim's joint research team identifies the ex-solution control phenomenon for perovskite materials

☐ GIST (Gwangju Institute of Science and Technology, President Kiseon Kim) School of Materials Science and Engineering Professor Bong-Joong Kim's research team in collaboration with POSTECH (President Moo-hwan Kim) Professor Jeong Woo Han and KAIST (President Seong-cheol Shin) Professor WooChul Jung have discovered a method of controlling the ex-solution* phenomenon of cations present in perovskite materials by controlling the bonding strength of cations and oxygen, and this can be used to control the formation of nanoparticles.

> * ex-solution: A phenomenon when a high-temperature reducing atmosphere (700-800 degrees Celsius or higher, hydrogen atmosphere) is given, a specific metal component is separated from a specific oxide substrate or support (mainly perovskite-structured oxides such as ABO3) to the surface of the substrate. Precious or highly active metals, usually replaced by B atomic sites, come to the substrate surface to form particles.

☐ Ex-solution technology is a method for making metal nanoparticles in real time through phase change of metal oxides using oxidation and reduction. This phenomenon is attracting attention as an eco-friendly future energy technology because nano-catalysts with high performance and high stability are spontaneously formed on the surface of metal oxides in a reducing atmosphere without any special process.

☐ The joint research team adjusted the bonding strength of cations and oxygen to make nanoparticles faster while maintaining high thermal stability at low

temperatures. In particular, the binding length of cations and oxygen was controlled by substituting an element with a large ion radius. When this new method was applied to an oxidation catalyst, researchers confirmed that the catalytic activity was increased up to 4 times compared to the existing ex-solution catalyst.

- The material synthesized through ex-solution is expected to help increase battery life by improving the durability of the fuel cell electrode. In addition, it is expected to be easily applied to gas sensors, reforming reactions, and chemical catalysts using various metal oxide-based nanoparticle catalysts.

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