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GIST College student Min-hee Seok publishes two papers as the first author in an SCI journal

- GIST (President Kiseon Kim) College (Dean Yong-Ju Lee) student Min-hee Seok (senior materials science and engineering major, advisor Professor Chang Hyuck Choi of the School of Materials Science and Engineering) published two papers as the first author in the SCI journal *Catalysis Today*.
- Min-hee Seok, an undergraduate researcher for Professor Chang Hyuck Choi of the School of Materials Science and Engineering, used transition metal-based oxygen reduction reaction electrode catalyst Me-N-C and researched: ▲ (1): direct production of hydrogen peroxide, a useful chemical from oxygen and ▲ (2): inevitable active degradation of the Fe-N-C electrode catalyst during ink fabrication.
 - The first study presented a strategy to intentionally increase the selection level for negative reactions that produce high value hydrogen peroxide. Metallurgical-based oxygen-reactive electrode catalyst Me-N-C is a low-cost/high-efficiency electrode catalyst to replace platinum catalyst used in high-molecular electrolytic fuel cell, which is generally an electrode catalyst for electrochemical

return of oxygen to water. It was found that negative reactions resulted in a return of oxygen to hydrogen peroxide, not water.

- The selectivity of hydrogen peroxide production was analyzed by changing the physical and chemical properties of the catalyst by surface modification of the catalyst and the metal materials used in the electrode catalyst. It is expected to be applied to electrochemical hydrogen peroxide production process.
- The second study observed the acid base properties of the catalyst's wet/dry surface of the Fe-N-C electrode catalyst in the ink making process, an inevitable process in the utilization of electrode catalyst, by measuring the zeta potential *, and decreased activity due to changes in properties.

* zeta potential: Potential at the electrolyte interface at the electrode catalyst surface and in the surrounding fluid and is strongly influenced by the constituent elements and functional groups of the catalyst surface.

- Unlike the commercial platinum catalyst, the physical/chemical properties of the catalytic carbon surface greatly affected the activity of the Me-NC catalyst. The catalytic activity, selectivity, and stability were increased by changing the physical/chemical properties of the catalyst surface. It is expected to contribute to research on increasing stability.

□ GIST College student Min-hee Seok said, "I was interested in electrode catalyst research through G-SURF *, a research program at GIST College, and it was an opportunity to decide on my future career as a researcher. I am grateful to the professor, the lab seniors who have helped me to make the fruits of the two year efforts, and GIST College which provided the opportunity for the research that started in 2017."

* G-SURF is a program that benchmarks Caltech's SURF, offering students the opportunity to gain research experience in a graduate lab, to practice applying basic scientific principles and knowledge to actual research (to improve creativity and problem-solving ability), and learn qualities required of researchers through mentoring and experiencing life in a laboratory (communication skills and cooperation).

- Min-hee Seok participated in G-SURF at GIST in 2017 and learned about the electro-catalysis and analyzed materials and using basic science principles and knowledge. Since then, he has participated in various research activities as an undergraduate research student and has developed my skills as a researcher.

- Two studies conducted by Min-hee Seok, a student at GIST University, as the first authors were conducted with support from the Korea Research Foundation and the GIST Climate Change Response Research Project and were published on May 14, 2019, in *Catalysis Today*.

