Korean Scientists Develop World's First Ultra-Sensitive Flexible Ammonia Sensor.

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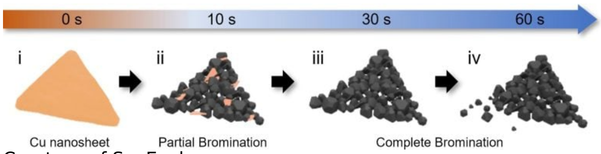
Courtesy of SynEvol
Credit: Korea Institute of Materials Science

A group of researchers from the Energy & Environmental Materials Research Division at the Korea Institute of Materials Science (KIMS), spearheaded by Dr. Jongwon Yoon, Dr. Jeongdae Kwon, and Dr. Yonghoon Kim, has created the first-ever ammonia (NH_3) gas sensor utilizing a copper bromide (CuBr) film. This sensor can be created using an easy, low-temperature solution method, representing a significant progress in sensor technology.

The new CuBr-based sensor provides multiple advantages: it is flexible, very sensitive, highly selective, and economical to produce. Ammonia sensors play a vital role in identifying airborne ammonia across various applications, such as environmental monitoring, industrial safety, and medical diagnostics. The electrical resistance of the CuBr film varies greatly when ammonia is present, enabling it to detect even small quantities of the gas with high precision.

In traditional approaches, creating the copper bromide (CuBr) film essential for the sensor involved a high-temperature vacuum procedure exceeding 500°C. This presented difficulties in applying it to flexible substrates, which are sensitive to heat, and resulted in elevated production expenses.



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To tackle this problem, the research group created a method to produce a two-dimensional copper nanosheet on a substrate at temperatures under 150°C without utilizing a vacuum process. They subsequently created the copper bromide film using a straightforward solution-based method. Consequently, they effectively developed an ammonia gas sensor on a plastic base.

This research effectively created a highly sensitive sensor that can identify ammonia levels as low as one part per million (ppm) through a low-temperature solution-based method. This advancement greatly lowers production expenses and presents potential uses in wearable sensors and diagnostic healthcare devices. Additionally, experimental trials with more than 1,000 repeated bending cycles verified that the sensor upheld excellent performance and functioned reliably.

Dr. Jongwon Yoon, the principal investigator, remarked, "The ammonia sensor created by this research holds significant promise for adaptation in flexible and wearable technologies." It can be employed in various applications, spanning from monitoring indoor air quality to managing individual health. “He further highlighted, “Specifically, we anticipate that it may serve as a disease diagnosis sensor by being affixed to the human body to assess exhaled breath.”