Docket #: S19-331

Durable and Immersible Network Enabled Ammonia Sensor for Water Monitoring

Stanford researchers have designed an ammonia sensor for water monitoring that is low cost, durable, immersible, and integrated into a cloud network. Capable of detecting down to 0.01 ppm, these sensors can be deployed in rivers, wastewater and possibly ocean waters for real-time, remote monitoring. By using chemically resistant platforms and a low power draw design, these sensors protect against fouling, which allows for longer immersion times and minimal field maintenance.

This technology is part of a portfolio of related inventions(S19-331, S20-348, S20-349, S23-336) that extracts value from wastewater by reclaiming ammonia from nitrate-contaminated wastewater streams.

Stage of Development - Prototype

Applications

- **Water quality monitoring via IoT:** ammonia detection
- **Harmful algae bloom prediction**

Advantages

- **Low power consumption**
- Low cost, off-the-shelf components
- Anti-fouling, fully immersible system
- Remote operation without the need for human intervention or interpretation

Publications

- Tarpeh, W. A., Senesky, D. G., Lalwani, A. V., Holliday, M., Mu, L., Clark, B. D., Liu, M.J., Dong, H., & Guo, J. (2022). *U.S. Patent Application No. 17/642,902*.
- Roberts, T. (2024). William Tarpeh taps the potential of polluted water. *Stanford News*. https://news.stanford.edu/stories/2024/10/william-tarpeh-creativity-leads-innovative-wastewater-transformations
- Guo, J., Liu, M. J., Laguna, C., Miller, D. M., Williams, K. S., Clark, B. D., B.D., Muñoz, C., Blair, S.J., Nielander, A.C., Jaramillo, T.F., & Tarpeh, W. A. (2024). Electrodialysis and nitrate reduction (EDNR) to enable distributed ammonia manufacturing from wastewaters. *Energy & Environmental Science, 17*(22), 8787-8800. DOI: 10.1039/D4EE03002H
- Tarpeh, W. A., Liu, M. J., & Clark, B. D. (2023). *U.S. Patent Application No. 18/041,769*.
- Tarpeh, W. A., Kogler, A., Clark, B. D., Liu, M. J., & Chow, W. (2024). *U.S. Patent Application No. 18/041,678*.
- Miller, D. M., Liu, M. J., Abels, K., Kogler, A., Williams, K. S., & Tarpeh, W. A. (2024). Engineering a molecular electrocatalytic system for energy-efficient ammonia production from wastewater nitrate. *Energy & Environmental Science, 17*(15), 5691-5705. DOI: 10.1039/D4EE01727G

Patents

- Published Application: WO2021055792
- Published Application: 20220365059
- Issued: 12,596,114 (USA)

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