Metal oxide semiconductor sensor based ammonia monitoring system prototype for use in poultry houses

Technology #16142

NCSU is currently seeking an industry partner to commercialize an ammonia sensor for use in poultry houses.

Abstract

Ammonia is produced in poultry houses due to the chemical decomposition of uric acid, which is found in bird droppings. It is important to monitor the ammonia levels in poultry houses for human safety, bird welfare and environmental impact. OSHA and NIOSH recommend a 50 ppm and 25 ppm exposure limit for humans, respectively. An increase over 30 ppm can affect the health condition of the birds, including reduction in weight gain, increased mortality, reduced carcass quality since high ammonia levels can damage the mucous membrane and reduce the bird's ability to fight off infections. Current management grade technologies that are in place have large upkeep costs and/or poor accuracy, in the critical range of detection; this has prevented large-scale adoption.

The metal oxide semiconductor (MOS) ammonia sensor could be a suitable candidate for ammonia monitoring poultry houses except for one major weakness: its response is affected by humidity levels in the poultry house. Researchers at NC State University have developed and tested an algorithm that allows the MOS ammonia sensor's response to account for humidity. This novel process and algorithm provides a quick response time, less than a minute, with low relative error. The low cost and accuracy of this system could lead to large-scale adoption by poultry producers.

Advantages

- Low cost
• Long lifetime
• Quick response time
• Real time display of oxygen concentration, temperature and relative humidity
• Systems could be modified for data logging and wireless communication
• Mobility

About the Inventors

Dr. Sanjay Shah is a professor at NC State Department of Biological and Agricultural Engineering. His research interests are focused on animal waste management, agricultural air quality and the use of renewable energy in livestock production.

Inventors

Tianheng Lin
Edd Harris
Sanjay Shah