

Research highlights

Monitoring health of milk cows

The mass production of high quality milk necessitates routine monitoring of the health of dairy cows. In particular, monitoring the pH, electrical conductivity, and temperature of the rumen would enable precise control of the feeding system to optimize the stomach conditions.

Here, Masato Futagawa and colleagues at Toyohashi University of Technology describe a wireless multimodal sensor system for measuring the electrical conductivity and temperature of the stomach of a dairy cow.

The electrical conductivity (EC) and temperature sensor were integrated on the same chip using silicon CMOS technology. Specifically, the electrical conductivity was determined by the resistance between two Pt electrodes, and the temperature by analysis of the current-voltage characteristics of a p-n junction diode.

Real time measurements were made by constructing a wireless system consisting of sensors, battery, antenna, analog signal-processing circuit board, AC-to-DC converter board, and receiver-transmitter board.

The system was used to measure EC (0.4-0.7 (S/m)) and temperature (32 – 39 °C) before, during and after feeding the cow.

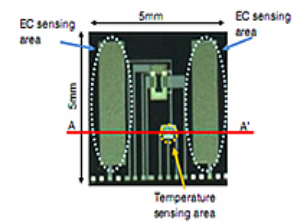
This technology is also being used to monitor the growth of agricultural products including tomatoes.

Reference

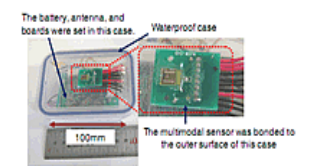
Masato Futagawa, Taichi Iwasaki, Mitsuyoshi Ishida, Keita Kamado, Makoto Ishida, and Kazuaki Sawada
A Real-Time Monitoring System Using a Multimodal Sensor with an Electrical Conductivity Sensor and a Temperature Sensor for Cow Health Control
Jpn. J. Appl. Phys. 49, 04DL12, (2010).



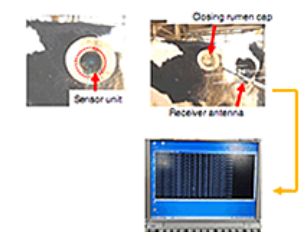
Masato Futagawa



EC and temperature sensors on the same silicon chip



Actual components of the multi-modal sensor system



Real time measurements of the rumen of a cow