



Ultrasonic Welding with Real-Time Quality Control

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an ultrasonic welding system that uses thin-film sensors to monitor temperature and heat flux.

Overview

In ultrasonic welding, work pieces are clamped between a horn and anvil and then joined using high-frequency vibration energy. Friction and heat between the surfaces causes them to soften and meld together upon cooling. Battery tabs needed for electric vehicles are formed in this way using ultrasonic energy. However, factors like temperature and heat flux are difficult to assess and control, leading to poor weld quality and reduced battery life.

Introducing a new sensor into the process could help monitor and control factors that are crucial to weld quality.

The Invention

UW–Madison researchers and others have developed an ultrasonic welding system that uses thin-film sensors to measure control values, like temperature and heat flux, at the working surface.

The system includes an anvil, welding horn and process controller. The process controller receives measurements taken by the sensors. It then can determine weld quality as the joint is being formed or record the results to help evaluate tool wear.

The thin-film sensors can be commercially available microelectromechanical systems (MEMS) sensors. They may be inserted into slots or attached in the welding device adjacent to the working surface.

Applications

- Quality control and monitoring
- Battery bus bar fabrication for electric cars

Key Benefits

- Temperature and heat flux is monitored *in situ*.
- Enables real-time process control
- Measurements can be recorded and compared over time.
- Can signal the need for tool repair or replacement

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Related Technologies

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- [WARF reference number P09303US02 describes embedded photonic sensors that can sense workpiece properties in hostile conditions.](#)

Tech Fields

- [Analytical Instrumentation, Methods & Materials : Sensors](#)
- [Engineering : Micro & nanotechnologies](#)

For current licensing status, please contact Michael Carey at mcarey@warf.org or 608-960-9867

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