Novel microsensor improves simultaneous pressure and temperature measurements

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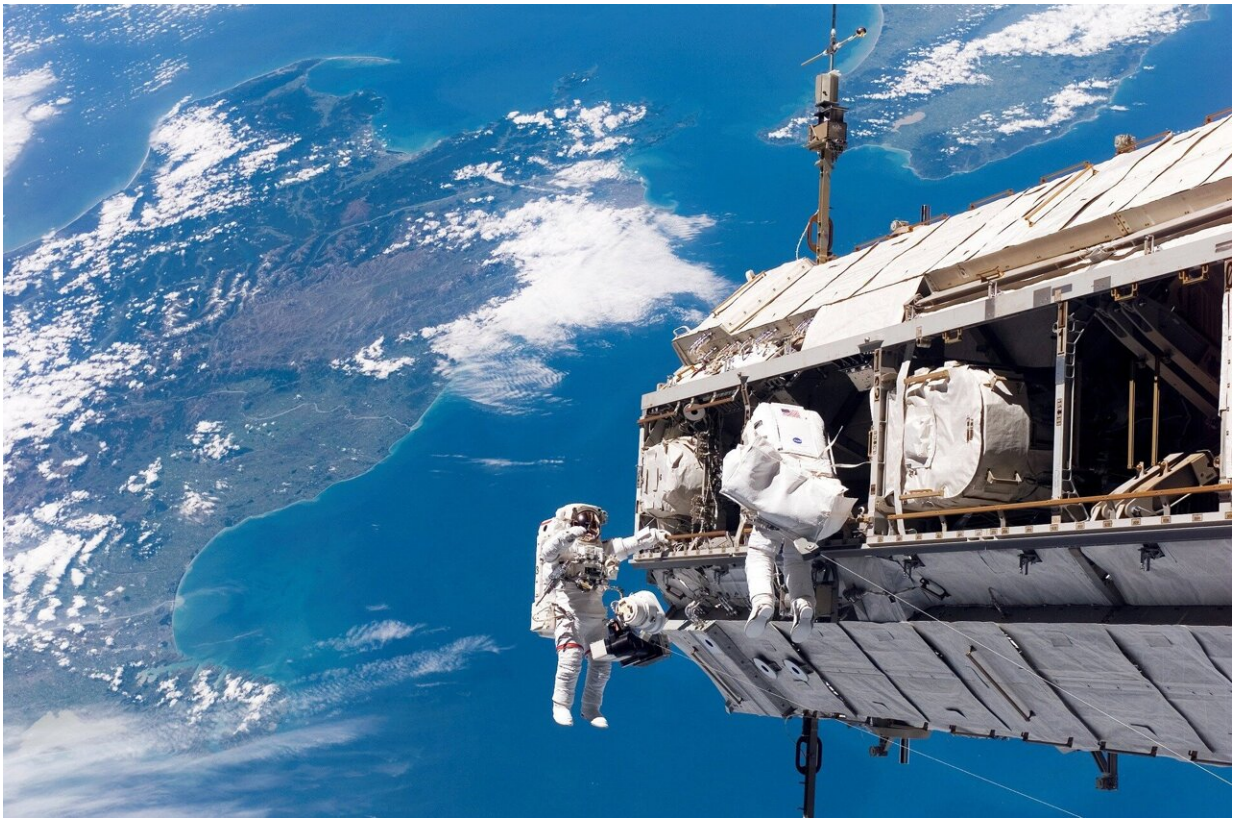

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Simultaneous measurements of the pressure and temperature find diverse applications in various fields including aerospace, environmental monitoring, and biomedical engineering.

In a study published in *Measurement*, conducted by a research team from the Key Laboratory of Transducer Technology, the Aerospace Information Research Institute (AIR) of the Chinese Academy of Sciences (CAS), an innovative pressure-temperature microsensor has been developed to achieve simultaneous pressure and temperature measurements.

Unlike conventional systems relying on the optical properties of fiber materials, this innovative microsensor utilizes the mechanical and thermal features of common semiconductor materials, marking a departure from traditional approaches.

The key concept behind this microsensor involves the utilization of two identical resonators working in tandem to achieve simultaneous pressure and temperature measurements. The pressure-sensing mechanism involves a pressure-sensitive diaphragm responding to external pressure, while the temperature sensing relies on the differences in the coefficients of thermal expansion among the composed materials of the microsensor.

The accuracy and effectiveness of the dual resonators were rigorously evaluated through numerical simulations and experimental characterizations. The pressure and temperature sensitivities were precisely calculated, and the results were subsequently verified through real-world testing.

Additional characterizations unveiled impressive performance metrics for the microsensor. The measurement errors for pressure and temperature were found to be within a range of -10 Pa to 40 Pa and -0.25°C to 0.26°C, respectively. These errors translate to an outstanding accuracy of ±0.01%FS (Full Scale) for pressure measurements and ±0.2%FS for temperature measurements.

This study holds promise for a wide array of applications, where precise and simultaneous monitoring of pressure and temperature is paramount. The ability of this microsensor to operate within such a tight error range opens the door to enhanced efficiency and accuracy in fields from industrial process to scientific research.

More information: Yulan Lu et al, A pressure- temperature microsensor based on synergistical sensing of dual resonators, *Measurement* (2023). DOI: 10.1016/j.measurement.2023.113946

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