

TCSUH Special Seminar

Micro-thermoelectric Devices

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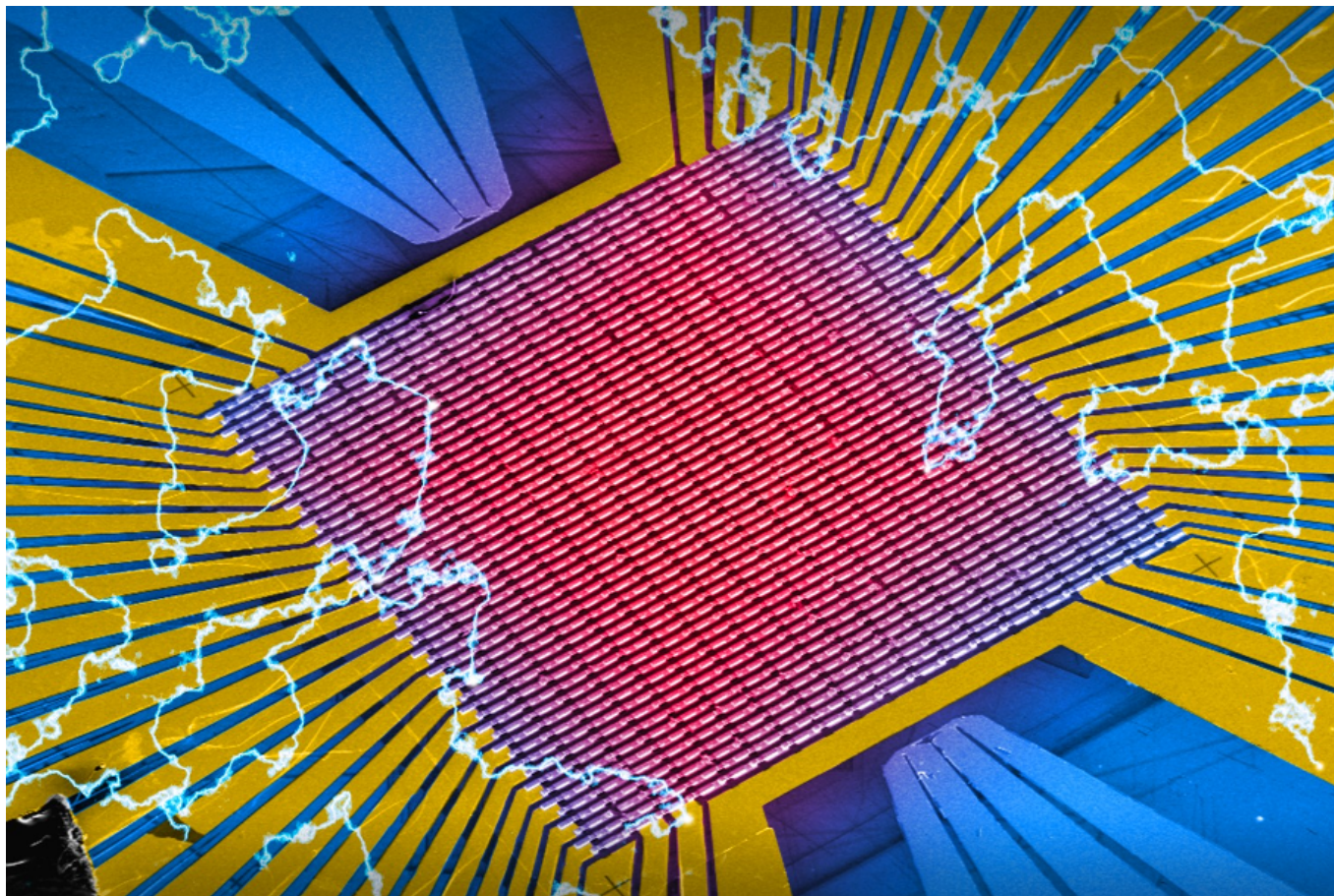
Room 102, Houston Science Center, 12:00 pm. – 1:00 p.m.

Sandwiches provided first come, first served.



ABSTRACT: Sustainable energy harvesting and efficient thermal management are required for the development of highly integrated electronic devices, the Internet of Things, and flexible and wearable technology. Micro-thermoelectric devices, which are capable of generating electricity from waste heat or using electricity to generate local cooling, are a promising solution. The devices have, in particular, a smaller leg cross-section and height than their commercial, macroscopic counterparts and can thus offer a faster response, higher resolution and greater power density. They can also be integrated with multifunctional microelectronic devices. Here we review the development of micro-thermoelectric devices. We examine progress in device design, integration, characterization, and performance, and explore potential applications in cooling, power generation and sensing. We also analyse the key challenges that need to be addressed to create high-performance devices and realize the full commercial potential of the technology.

BIO: Kornelius Nielsch has been director of the Institute for Metallic Materials (IMW) at the Leibniz Institute for Solid State and Materials Research Dresden (IFW) since 2015, where he leads a research group working at the interface of design and synthesis of thermoelectric, superconducting, magnetic and quantum materials. Prof. Nielsch received his diploma in physics from the University of Duisburg in 1997 and his Ph.D. in physics from Martin Luther University Halle/Wittenberg, Germany, in 2002. From 2002 to 2003, Kornelius Nielsch was a postdoctoral fellow at MIT before taking up the position of group leader at the Max Planck Institute for Microstructure Physics in Halle, Germany, in 2003. Soon after, he moved to the Institute of Applied Physics at the University of Hamburg, where he was Professor of Experimental Physics from 2007 to 2015.



References:

1. Zhang, Q., Deng, K., Wilkens, L., Nielsch, K. et al. Micro-thermoelectric devices. *Nat. Electron.* 5, 333–347 (2022).
2. Dutt, A. S., Deng, K., Li, G., Pulumati, N., Ramos, D. L., Barati, V., Garcia, J., Perez, N., Nielsch, K., Schierning, G., Reith, H., *Adv. Electronic Mater.* 8, 2101042 (2022).
3. Li, G., Garcia Fernandez, J., Lara Ramos, D.A., Nielsch, K. et al. Integrated microthermoelectric coolers with rapid response time and high device reliability. *Nat. Electron.* 1, 555–561 (2018).

Please contact Dr. Zhifeng Ren at zren2@central.uh.edu if you want to meet with the speaker.

**Persons with disabilities who require special accommodations
to attend this lecture should call (713) 743-8212.**