

Heat Dissipation in Electronic Devices

Abstract :One of the greatest challenges of modern society is related to energy consumption, dissipation and waste. A prominent example is that of integrated electronics, where power dissipation issues have become one of its greatest challenges. In the first part of my talk, I will discuss how to characterize energy dissipation in electronics, like heating in transistors based on 2D materials or in the conductive filaments of resistive random-access memories (RRAM), using spatially resolved thermometry. Gaining thermal insights of our electronics is essential to design energy efficient circuits and understand and optimize ultra-dense data storage. Additionally, a better management of the heat that is dissipated by these electronics is bound to have a major impact in modern technology. In the second part of my talk, I will present novel thermal control devices, like thermal switches and rectifiers, for thermal management applications. The goal of these devices is to control the residual heat dissipated by systems in a manner analogous to how electrical devices control electricity. As an example, thermal control devices will enable better management of thermal transients than heat sinking alone. I will present some pioneer nano- and micro-thermal devices that lay the foundations for new advances in thermal management and some thermometry technique opportunities to characterize them.