The effect of the MEMS measurement platform design on the Seebeck coefficient measurement of a single nanowire

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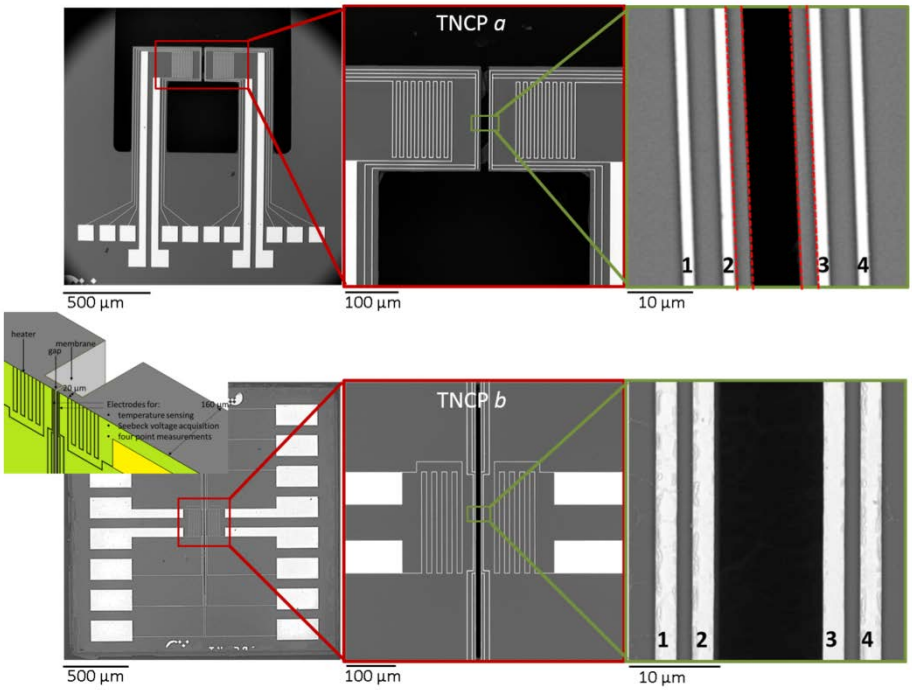
Short Abstract

We previously developed a thermoelectric nanowire characterization platform (TNCP) to study the thermoelectric properties of individual nanowires. Here, we report on a redesigned platform aiming to optimise performance, mechanical stability and usability. We compare both platforms for electrical conductivity and the Seebeck coefficient for an individual Ag nanowire. Whereas the electrical conductivity is comparable, the Seebeck coefficient shows a 50% deviation compared to the previous studies, possibly due to the design of the platform leading to temperature gradients along the bond pads. Another major reason for the variation of the measurement results is the non-homogeneous temperature distribution along the thermometer. We conclude that for the measurement of small Seebeck coefficients, an isothermal positioning of voltage-probing bond pads, as well as a constant temperature profile at the measurement zone are essential.



Above. The two measurement platforms. Top: TNCP a, cantilever-based design; bottom: TNCP b, membrane-based design. The schematic inset illustrates Platform b's cross-section to show its layout. In both cases, the electrodes are made of Pt.