Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supporting Information

Experimental Measurements of Surface Temperature

An RTD was fabricated on borosilicate glass with dimensions $20\mu m$ by $20\mu m$, using depositions patterns of $10nm$ chromium, $35nm$ platinum, and finally a thin layer (~$10nm$) of silicon dioxide. The RTD response was calibrated in a temperature controlled oven to be 2.393 $K/k\Omega$. Used in conjunction with a picoammeter, the RTD has a resolution uncertainty of $0.002K$. The RTD substrate is mounted to a nano-scale positioning stage in an SEM vacuum chamber. Temperature measurements were collected *via* RTD from a gas jet nozzle mounted at a 45° tilt from the surface normal and the $138\mu m$ outer diameter edge is offset $20\mu m$ above the substrate. Gas jets exit the $75\mu m$ inner diameter nozzle in the upward direction relative to Figures A1 through A3, which report the full 2D surface maps of the RTD measurements collected for argon gas jets at the flow rates 4.3 and 7.0 *sccm* and an oxygen gas jet of 7.3 *sccm*. The surface region compared to DSMC-Hard-Cube model predictions is outlined in each figure.

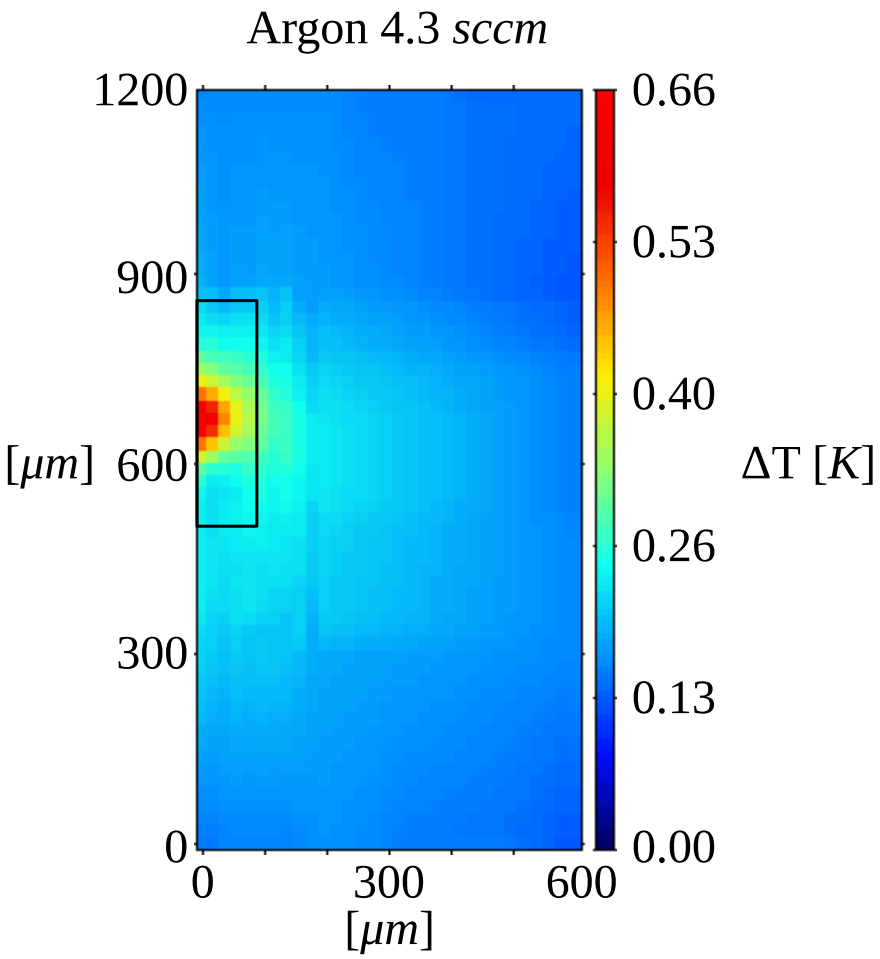

Figure A1*: RTD measurements of the surface thermal response are collected for an argon gas jet at the flow rate of 4.3 ± 0.14 sccm. RTD temperature measurement uncertainty is ± 0.002K.*

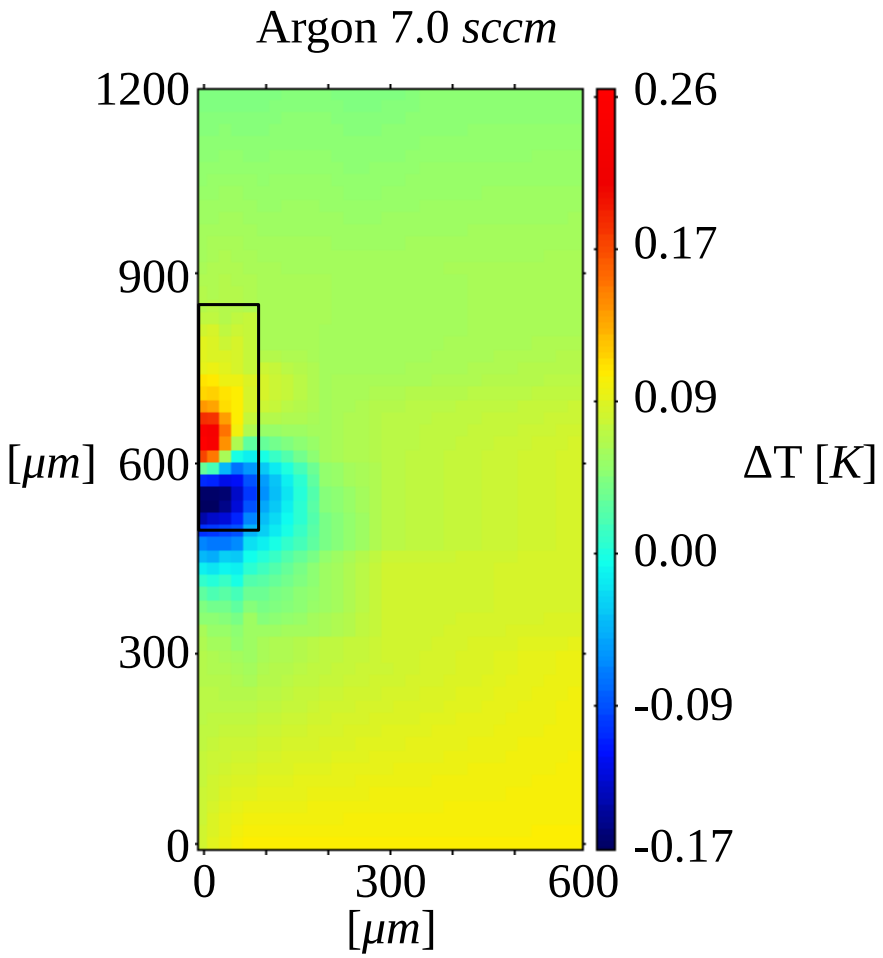

Figure A2*: RTD measurements of the surface thermal response are collected for an argon gas jet at the flow rate of 7.0 ± 0.14 sccm. RTD temperature measurement uncertainty is ± 0.002K.*

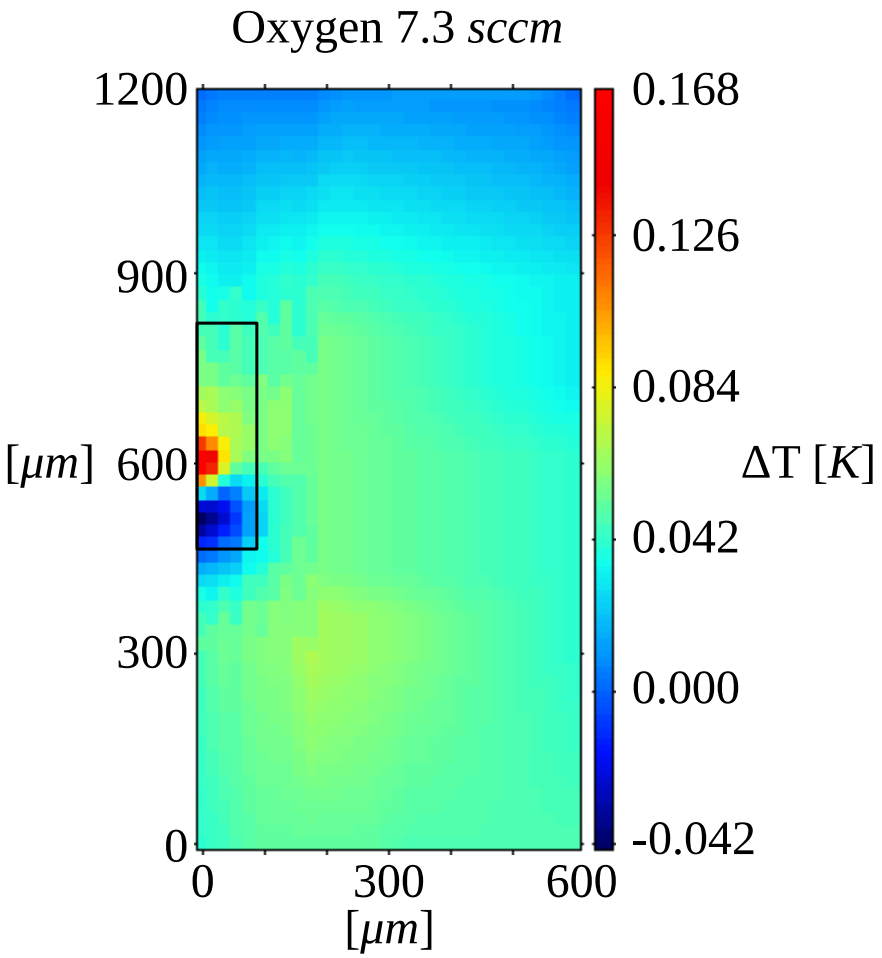

Figure A3*: RTD measurements of the surface thermal response is collected for an oxygen gas jet at the flow rate of 7.3 ± 0.1 sccm. RTD temperature measurement uncertainty is ± 0.002K.*