Supporting Information

Nanometer scale infrared spectroscopy of heterogeneous polymer nanostructures fabricated by tip-based nanofabrication

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Heat Transfer Model for Two Overlapping Polymer Nanostructures

Transient, 3D conduction heat transfer for overlapping polymer nanostructures was modeled in Comsol. Figure S1 shows a 2D Temperature profile of the overlapping structures near the interface between them at a time 1 ns after the 10 ns laser pulse. The first polymer nanostructure was modeled as a 5 um long half-cylinder with a 600 nm radius, and the second polymer structure was a 5 um long half-cylinder with a 100 nm radius. The thermal conductivity, density, and specific heat for the polymer were k = 0.1 W/m-K, ρ = 950 kg/m3, and C_p = 2000 J/kg-K.[1, 2] The zinc selenide prism had thermal properties k = 18 W/m-K, ρ = 5270 kg/m^3, and C_p = 343 J/kg-K.[3] The 10 ns laser pulse was modeled as a constant internal heat generation. The time step and the mesh size were chosen for stability and convergence, and the model utilized symmetry to reduce computation time. Monitoring the temperature over time on the PE nanostructure showed that the temperature rise reached only 8% of the maximum temperature within the PS structure at a distance 100 nm away from the interface. Further, the temperature on the PE structure 20 nm away from the PS structure rose to only 33% of the max

PS structure temperature. The heat flow to the PE structure and to the ZnSe prism below was calculated by integrating the heat flux over each respective boundary, and it was determined that 90% of the heat flow occurred from the absorbing feature to the substrate.

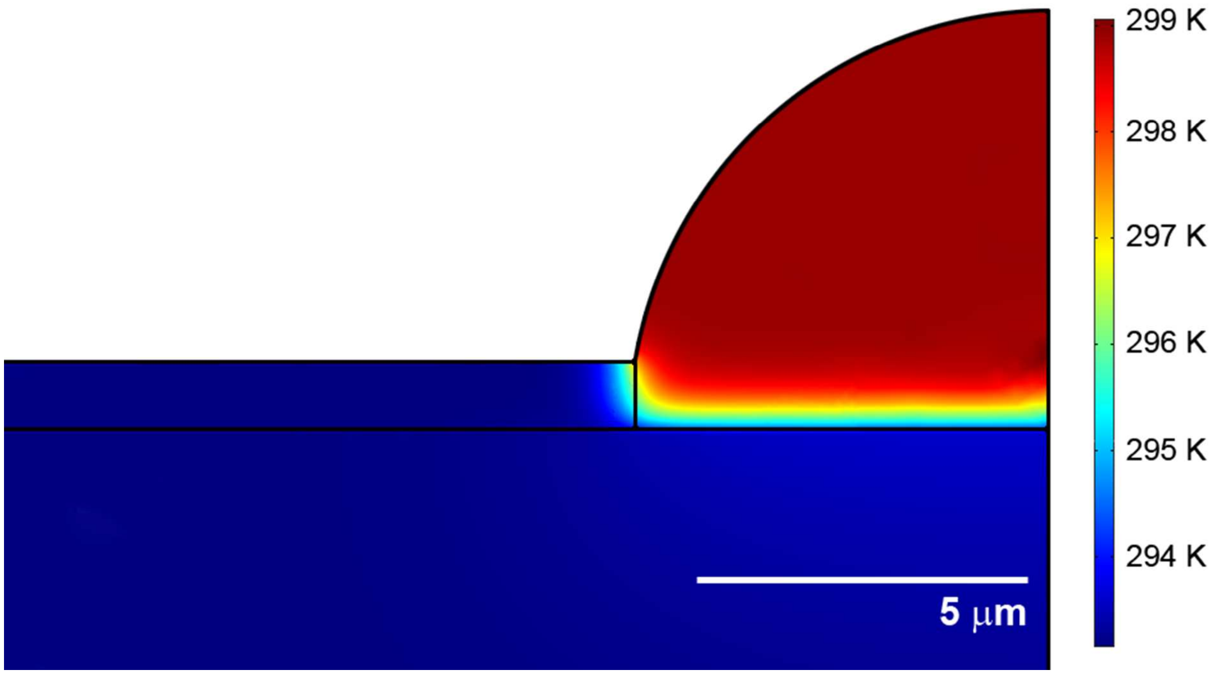

Figure S1: Comsol 2D temperature map at the interface between a PS and PE nanostructure 1 ns after the 10 ns uniform heat generation within the PS nanostructure.

References

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3. Sankar, N.; Ramachandran, K.On the Thermal and Optical Properties of Znse and Doped Znse Crystals Grown by Pvt. *J. Cryst. Growth* **2003,** 247, 157-165.