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Nanoscale Thermal Transport in Polymers

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Polymers are an interesting class of soft matter which have a wide range of applications. Nanoscale thermal transport processes in polymers are of increasing importance due to the tremendous advancement in nanostructured polymeric materials and devices with great flexibility and scalability. Thermal conductivity of polymers is highly morphology-dependent. Our group has been working on thermal transport properties of different polymers at the nanoscale. In this talk, I will first present the chain confinement effects observed in amorphous polymer thin films, which highlights the fundamental difference in heat conduction between crystalline polymers and amorphous polymers. I will then discuss the topology and morphology effects on thermal transport using a novel class of polymers – bottlebrush polymers. Finally, thermal rectification in tapered bottlebrush polymers will be covered.