Structural Origin of the Thermal Resistance of Fluid Interfaces

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The interfacial thermal resistance determines the characteristic time scale for heat transfer across interfaces separating materials with distinctive thermal conductivity properties. It is therefore relevant in interfacial situations such as condensation-evaporation processes or energy transport across nonmaterial-fluid interfaces. We have combined non-equilibrium molecular simulation and intrinsic interfacial analyses to resolve the interfacial structure responsible for the interfacial resistance of the interface in fluid interfaces. In this way we can define a thermal resistance layer, which is connected to a low density layer at the surface of the fluid. For liquid-vapor interfaces, the thermal resistance layer is a boundary where the thermal transport mechanism changes from ballistic in the vapour phase to collisional in the liquid phase. The thermal conductance is found to vary linearly with the number of atoms in the thermal resistance layer.

References:

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