Fluidic Transmitting Mechanism of Water-Carbon Nanotubes Nanotransmission

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The transmission mechanism of the water-carbon nanotubes (CNTs) fluidic transmitting nano-device is investigated by using molecular dynamics simulation with considering the loading, charging and thermal effects. The external load on the driven CNT can slow down the startup speed of the nano-transmission while the transmitting stability is better than that in non-loading transmitting process. The startup speed of the water-CNTs transmission increases with enlarging the charge magnitude on CNTs since the charges on CNT atoms can increase the water-CNT interfacial coupling strength. The control of the water temperature can also affect the startup speed of the driven CNT attributed to the thermal effect on the slip velocity of confined water. The configuration, dynamic motion behaviors and temperature of the confined water in both starting and steady transmitting processes are studied to understand the thermo-electro-mechanical coupling effects on the transmission mechanism of the water-CNTs charge-controlled fluidic transmitting nano-device.

Keywords: Carbon nanotubes, nanotransmission, coupling effect, molecular dynamics simulation