Electronic Supplementary Material

Quantum “contact” friction: The contribution of kinetic friction coefficient from thermal fluctuations

Rasoul KHEIRI*

Skolkovo Institute of Science and Technology, Moscow 121205, Russia

Supporting information to https://doi.org/10.1007/s40544-022-0719-1

A comparison between classical and quantum derivations of the kinetic friction coefficients could be possible by considering not only the saturated but also unsaturated cases of the classical friction coefficient in the integral of Eq. (22).

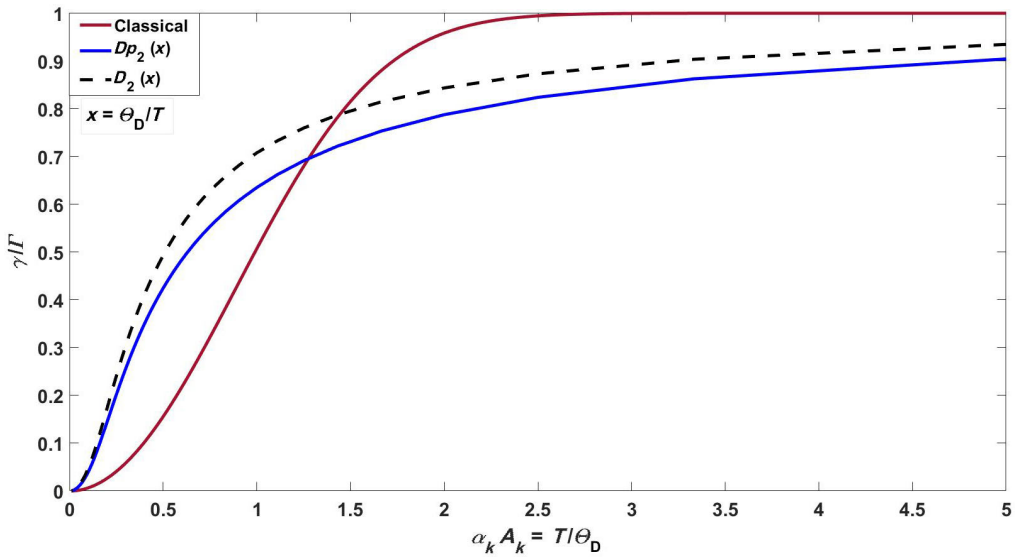

Fig. S1 A comparison between the classical (red) and quantized (blue) kinetic friction coefficients by assuming $(\alpha_k A_k)_{\max} = T/\Theta_D$. The dashed line is the second Debye function, Eq. (46), as the first approximation of the quantized friction coefficient. The blue line is Eq. (49), and the red line is the classical Eq. (21) including unsaturated cases.

Figure S1 shows that assuming $(\alpha_k A_k)_{\max} = T/\Theta_D$, an upper limit around three will saturate the integral of Eq. (22). Moreover, Fig. S1 shows that the classical derivation of the kinetic friction coefficient will reach the asymptotic value of Γ faster than the quantized derivation. However, the quantization speeds ups the value of γ at lower temperatures up to the Debye temperature and a little further.

* Corresponding author: Rasoul KHERI, E-mail: R.Kheiri@skoltech.ru