1-1-2002

Comment on “Stress-density ratio slip-corrected Reynolds equation for ultra-thin film gas bearing lubrication”

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PHYSICS OF FLUIDS VOLUME 14, NUMBER 10 OCTOBER 2002

COMMENTS

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Comment on "Stress-density ratio slip-corrected Reynolds equation for ultra-thin film gas bearing lubrication" [Phys. Fluids 14, 1450 (2002)]

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(Received 16 May 2002; accepted 27 June 2002; published 6 September 2002)

[DOI: 10.1063/1.1503800]

The stress-density model proposed in the paper[1] was presented and verified by numerical simulations in an earlier paper.[2] Specifically, Morris, Hannon, and Garcia[2] performed both molecular dynamics and direct simulation Monte Carlo (DSMC) simulations of Couette and Poiseuille flow and measured slip length (referred to as the coefficient of slipping, G, in Ref. 1) at high Knudsen number. Morris *et al.* found that if $\mathrm{Kn}<0.1$ then $G\approx\lambda_h$, where λ_h is the mean free path evaluated from the collision cross section. The slip length was observed to be significantly smaller than λ_h at higher Knudsen number; this result was verified recently by Wijesinghe and Hadjiconstantinou.[3] Most importantly, Morris *et al.* proposed approximating the slip length as $G=\alpha\lambda_v$ where λ_v is the mean free path evaluated from the viscosity.[4] When the effective viscosity is obtained from the wall shear stress they found that $\alpha\approx 1$ for a wide range of Knudsen number. Ng *et al.* performed DSMC simulations of slider bearing flow, which is a composite of Couette and Poiseuille flow.[5] Since their simulations are performed at $\mathrm{Kn}\approx 1$, they also observe that $G<\lambda_h$. Comparing Eqs. (1)–(4), (7) and (10) in Ref. 2 with Eqs. (4), (6), and (7) in Ref. 1 shows that the stress-density model is equivalent to $G=\lambda_v$.

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