

Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Altering the Flow of Gas through Modification of Surface Films

DONGJIN SEO, WILLIAM DUCKER, Virginia Tech — Normally the flow of gas in a channel is considered to be a function of the pressure difference between the ends of the channel and the geometry. For high Knudsen numbers, the flow also depends on the tangential momentum accommodation coefficients (TMAC). Here we consider methods of altering the TMAC, and thus the flow of gas at 1 atm through a narrow channel, by the use of surface films that alter the TMAC. Gas flow was determined by measuring the damping on a glass sphere as a function of separation from a flat plate. The solids were coated with octadecyltrichlorosilane (OTS), which undergoes a melting-like transition near room temperature. The measured damping passes through a maximum in the temperature range of 9 - 42 °C and thus the TMAC also passes through a maximum. We attribute this maximum to competing effects due to the decrease in surface roughness and the decrease in stiffness as a function of temperature. Control of flow via alteration of a surface film should also be possible using other methods of altering the state of surface films.

Dongjin Seo
Virginia Tech

Date submitted: 02 Aug 2013

Electronic form version 1.4