Gaseous Viscous Peeling of Linearly Elastic Substrates[1] SHAI EL-BAZ, HILA JACOB, AMIR GAT, Technion - Israel Institute of Technology — We study pressure-driven propagation of gas into a micron-scale gap between two linearly elastic substrates. Applying the lubrication approximation, the governing nonlinear evolution equation describes the interaction between elasticity and viscosity, as well as weak rarefaction and low-Mach-number compressibility, characteristic to gaseous microflows. Several physical limits allow simplification of the evolution equation and enable solution by self-similarity. During the peeling process the flow-field transitions between the different limits and the respective approximate solutions. The sequence of limits occurring during the propagation dynamics can be related to the thickness of the prewetting layer of the configuration at rest, yielding an approximate description of the entire peeling dynamics. The results are validated by numerical solutions of the evolution equation.

Amir Gat
Technion - Israel Institute of Technology