

Simplified model of spreading rivulet of viscous liquid on an inclined wetted plate

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Abstract. Rivulet type flow down an inclined plate is of great importance in many engineering areas including packed columns design and catalytic reactors modeling. Combining a simplified solution of the Navier-Stokes equation for a rectilinear rivulet and the Cox-Voinov law for an axisymmetric spreading of a perfectly wetting liquid, we derived a semi-analytical model of the liquid flow in a spreading rivulet. The proposed model was used to characterize the flow of a liquid in dependence of the plate inclination angle, rivulet dynamic contact angle and liquid flow rate. The presented modeling method provides an insight on the liquid flow properties without the necessity of numerically solving the corresponding PDEs.

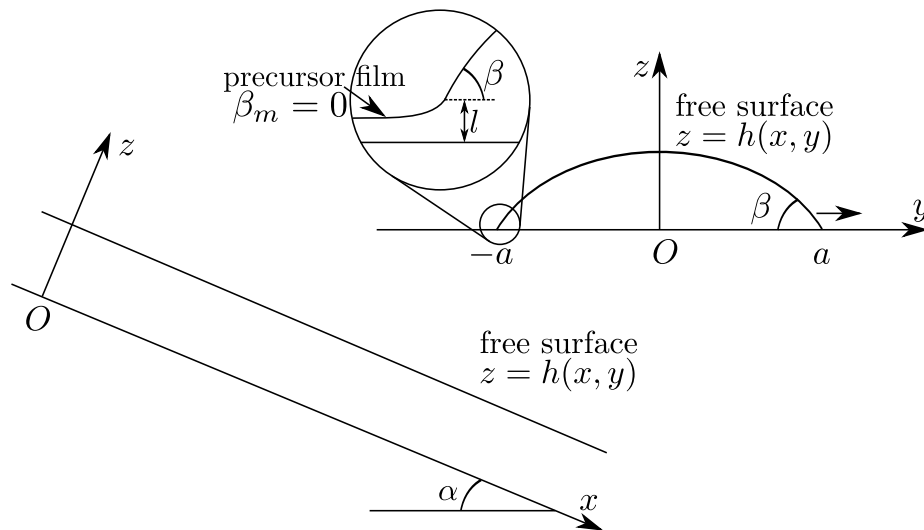


Figure 1: Used coordinate system with the basics of rivulet spreading notation. Letter α stands for the plate inclination angle, β and β_m are the apparent (dynamic) and the microscopic contact angles, a is the rivulet half width.

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