Description for the general public

Hydrophobic sprays, paints, fabric or clothing covers are being commonly used. So that is why, it can be said that, the concept of hydrophobicity appears more and more often in everyday life. Despite that, the phenomenon of liquid interaction with different types of surfaces is still not fully understood and described by scientists. Research conducted by the applicant is focused on the phenomenon of the flow inside tubes (see fig. 1) and interaction of water drops with surfaces. Both flat surfaces and tubes have different physico-chemical properties. When the droplet is considered, the final effect of its collision with surface or any interaction of liquids may be wetting of the surface or, quite the opposite, liquid separation from the substrate. The primary principle of determining the degree of wettability is the information on the static value of the contact angle θ_E. Depending on the value of the contact angle, surfaces are categorized as hydrophilic $\theta < 90^o$, hydrophobic $\theta > 90^o$ or superhydrophobic $\theta > 150^o$. The conducted research shows that this parameter is not sufficient to fully describe the flow scenario. Modern research confirms that the dynamic contact angle θ_D is directly related to the speed of a three-phase line V. Over the years, many models have been developed to define the relationship between the dynamic contact angle and the dimensionless capillary number $\mathbb{C}a$ (directly related to the speed of propagation of the contact line). The results from the Investigator's studies, carried out with the use of a super-fast camera and in-house developed software for data analysis, show significant discrepancies with regard to existing models. Moreover, it appeared that the most commonly used model for the dependency of the contact angle on the velocity, does not take into account inertia effects (high velocities) and time dependency. Additionally, the influence of the surface wettability level on the flow scenario might be crucial. That is why, the main goal of the research is to determine physical relation between the dynamic contact angle θ_d and the velocity of the triple line V for dynamically moving triple line for surfaces having wide range of wettability. Nowadays, it is more accessible to conduct numerical simulations of the multiphase flows, hence it is extremely important to state models which can give results that maximally approximate the reality.

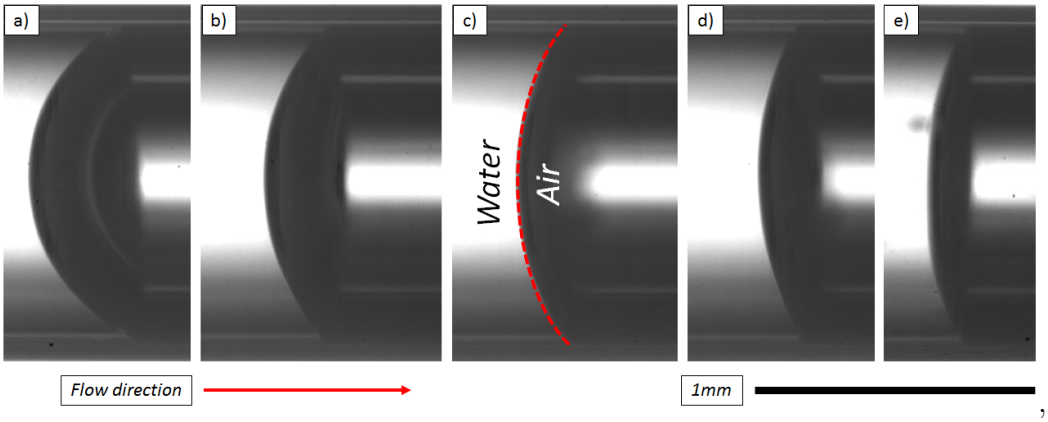

Figure 1: Menisci obtained for water flow inside the tube. Velocities from left to right : *a)* $0.003m/s$, *b)*$0.02m/s$, *c)* $0.04m/s$, *d)* $0.06m/s$, *e)* $0.3m/s$. Black bar in the right bottom corner indicates 1mm scale.