Tokyo University of Agriculture and Technology
Institute of Global Innovation Research

グローバルイノベーション研究院　公開セミナー
Institute of Global Innovation Research Open seminar

Friday, July 12 2019,13:00 -15:00

言語 / 英語　Language/English

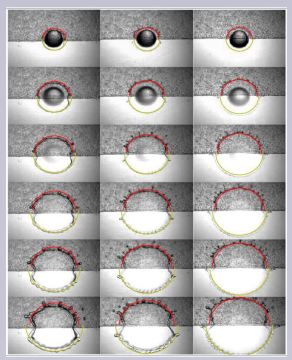
東京農工大学 小金井キャンパス 講義棟 L0026教室
Lecture Room L0026, Lecture Hall Building
Koganei Campus, TUAT

Program

13:00-14:00　“A theory on the spreading of droplets"

Dr. Jose M. Gordillo
Professor, University of Seville, Spain

Here we provide a self-consistent analytical solution describing the unsteady flow in the slender thin film which is expelled radially outwards when a drop hits a dry solid wall. Thanks to the fact that the fluxes of mass and momentum entering into the toroidal rim bordering the expanding liquid sheet are calculated analytically, we show here that our theoretical results closely follow the measured time-varying position of the rim with independence of the wetting properties of the substrate. The particularization of the equations describing the rim dynamics at the instant the drop reaches its maximal extension which, in analogy with the case of Savart sheets, is characterized by a value of the local Weber number equal to one, provides an algebraic equation for the maximum spreading radius also in excellent agreement with experiments. The self-consistent theory presented here, which does not make use of energetic arguments to predict the maximum spreading diameter of impacting drops, provides us with the time evolution of the thickness and of the velocity of the rim bordering the expanding sheet. This information is crucial in the calculation of the diameters and of the velocities of the droplets ejected radially outwards for drop impact velocities above the splashing threshold. We will use the results obtained to the particular case the substrate is superhydrophobic and will show that the theory is able to predict the splash threshold velocity and also the velocities and the diameters of the droplets ejected for impact velocities above this threshold.



14:00-15:00　"Drop splashing: Aerodynamic considerations"

Dr. Guillaume Riboux
Associate Professor, University of Seville, Spain

When a drop of a low viscosity liquid impacts against a smooth solid substrate at a velocity V, a liquid sheet of thickness very small compare to the drop radius is expelled tangentially to the substrate at high velocity compare to V. If the impact velocity is such that V > V* with V* the critical velocity for splashing, the edge of the expanding liquid sheet lifts off from the wall as a consequence of the gas lubrication force at the wedge region created between the advancing liquid front and the substrate. In the present talk, we show that the magnitude of the gas lubrication force is limited by the values of the slip lengths at the gas-liquid interface and at the solid. We demonstrate that the splashing regime changes depending on the value of the ratio of the slip lengths, a fact explaining the spreading-splashing-spreading-splashing transition for a reduced value of the surrounding gas pressure as the drop impact velocity increases. We also provide an expression for V* as a function of the inclination angle of the substrate, the drop radius, the material properties of the liquid and the gas and the mean free path of gas molecules.

■共催／Co-Organized by

グローバルイノベーション研究院 ライフサイエンス分野　田川研究チーム
Institute of Global Innovation “Life Science” Tagawa Team

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どなたでも、ご聴講いただけます。
Everyone is welcome to attend.

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