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VOF/PLIC model applied to dynamics wetting on rough surfaces

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Computational fluid dynamics (CFD) simulations of spreading drops over surfaces with roughness in which the details of the surface geometry must be resolved pose major challenges. A computational fluid dynamics (CFD) model, based on the volume of fluid (VOF) method with piecewise linear interface calculations method (PLIC) for interface reconstruction, was used to simulate a dynamic of spreading mineral, vegetable and silicone oils. This paper describes a multigrid tool for use with adaptively refined meshes around quadrilateral elements in two dimensions. It was shown that quadratic meshes are more appropriate to determine the profile of drops than the triangular meshes to describe the kinetic drop spreading. Numerical study has allowed the occurrence of the new regime "fast spreading" relating to silicon drops on glass at different roughness and appearance of the capillary regime followed by the gravity regime for minerals and vegetables oils on stainless steel substrates at constant roughness.Experimental and numerical simulation are in good agreement, we note that the simulation is as efficient in the case of drop spreading in rough surfaces as the spreading in smooth solid treated in our previous work.

Biography

Hocine Alla is a Professor in the Department of energetic physics at the University of Sciences and Technology (USTO), Oran City in Algeria, and the director research of wetting phenomenon at physics materials and fluids Laboratory. He received his bachelor degree in Mathematics from University of Es-Senia in 1989 and his PhD degrees in applied Mathematics from USTO University in 1996. He led many national research projects. He was a guest in great laboratories in Europe and author of several articles in prestigious journals. His research focuses on mathematical modeling and simulation of the spreading of drops on heterogeneous surfaces.

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