Drop impact on nonwetting nanoporous surfaces: formation of a novel air film and its influencing factors

People

Principle investigator: Dr. Günter K. Auernhammer
Person working on the project: Dr. Binyu Zhao

Abstract

Drop impact on solid surfaces is a ubiquitous phenomenon in nature and technological processes. It is generally accepted that a thin air film is entrapped underneath impinging drops. The dynamics of such air film is crucial for the outcome of drop impact and affects the heat transfer efficiency and drag in technological processes. For smooth substrates, the dynamics of the thin air films underneath impinging drops have been studied in detail. However, on rough or nanoporous surfaces, a fundamental understanding of the stability and dynamics of the air film is still missing as a function of drop and substrate properties. In preliminary experiments on nonwetting nanoporous alumina surfaces, we observed a novel kind of air film underneath impinging drops under ambient conditions. We suppose that the air in the closed pores couples to the entrapped air between impinging drops and the substrate. This project focuses on the formation mechanism and dynamics of this novel air film on nanoporous surfaces, elucidating the effects of the influencing factors involved and resolving the contribution of the novel air film on the drop impact dynamics.

Details

Time frame: 04/2021 until 03/2024
Funding agency: Deutsche Forschungsgemeinschaft (DFG), Project number: 456180046