INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

Name of the Student	:	Santanu Kumar Das
Roll Number	:	186103031
Programme of Study	:	Ph.D.

Thesis Title: DROP-DROP AND DROP-SURFACE DYNAMICS DURING IMPACT AND ELECTROHYDRODYNAMIC INTERACTIONS

Name of Thesis Supervisor(s)	:	Amaresh Dalal
Thesis Submitted to the Department/ Center	:	Mechanical Engineering
Date of completion of Thesis Viva-Voce Exam	:	11-10-2023
Key words for description of Thesis Work	:	interfacial flows, electrohydrodynamics, computational fluid dynamics

SHORT ABSTRACT

The interaction between drop-drop and drop-surface is an essential aspect of fundamental studies in fluid dynamics. Researchers have been interested in studying these dynamics for their applications in various industrial processes. To understand the fundamental aspects of drop-surface interactions, robust computational tools have been utilized. The transition regimes between coalescence and splashing of drops include jet formation with single or multiple secondary drops. Previous studies have demonstrated that the diameter of the secondary drop lies between 0.58 and 0.94 times the diameter of the impacting drop. However, the present study reveals that secondary drops larger than the primary impacting drop can be obtained at higher impact velocities. Due to the recent advancements in microfluidic devices and biological processes, electrohydrodynamic flows became a critical part of these investigations. The dispersion of drops in an emulsion is commonly seen in several chemical, pharmaceutical, and petroleum industries. The stability of these dispersions can be affected by an electric field. Studies with creeping flow approximations have shown that depending on the electrical properties, the drops can repel and move apart or get attracted toward each other. We defined a phase map representing regions for various drop interaction dynamics. Finally, we studied polymer blends essential in food, paint, cosmetics, and processing industries. The microstructure of the polymers resulting from drop deformation, coalescence, and breakup is directly related to the properties of these emulsions. A viscoelastic drop exhibits reduced deformation with higher viscoelasticity, while a Newtonian drop suspended in a viscoelastic medium shows non-monotonic behavior.