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Explosive Events in Bicomponent Droplet Impact on Superheated Substrates TAMAL ROY, Postdoctoral Research Associate, UDDALOK SEN, Posdoctoral Researcher, RANJAN GANGULY, Professor, LOUIS A. ANGELONI, Graduate Assistant, W. ANDREAS SCHROEDER, CONSTANTINE M. MEGARIDIS, Professor, DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING, UNIVERSITY OF ILLINOIS AT CHICAGO, USA TEAM, DEPARTMENT OF POWER ENGINEERING, JADAVPUR UNIVERSITY, KOLKATA, INDIA TEAM, DEPARTMENT OF PHYSICS, UNIVERSITY OF ILLINOIS AT CHICAGO, USA TEAM — Droplet impact on superheated smooth solids has attracted enormous attention since Leidenfrost reported the eponymous phenomenon more than 250 years ago. The related literature is almost exclusively focused on single component liquids, which maintain their identity even under disruptive boiling conditions. In this work, we provide evidence for the existence of a new regime - termed explosive boiling - for the impact of bicomponent (ethanol and water) droplets on superheated substrates at temperatures between the respective Leidenfrost temperatures of the two liquid constituents. This regime is characterized by a violent shattering of the main droplet upon impact, and is observed only for a certain range of alcohol concentrations of the binary mixture. We explore this behavior experimentally through high-speed imaging at different substrate temperatures, droplet concentrations, and impact velocities. Furthermore, we provide interferometric evidence for the cause of occurence of this unprecedented regime.

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