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Droplet impact on liquid films in the presence of surfactants<sup>1</sup> KHADIJAH JAIS, NATALIE YIP, Imperial College London, ZHIZHAO CHE, Tianjin University, China, OMAR MATAR, Imperial College London — In this study of droplet impact on liquid films, surfactants are added to the droplet, the liquid film or both, and the effects of different surfactant concentrations are investigated using high-speed imaging. The results show that surfactants suppress partial coalescence, due to damping of the capillary waves. Rebounding occurs more frequently when surfactants are added, as the surfactant molecules resist the drainage of the intervening air layer. When the droplet deforms the surfactant film, there is an uneven distribution of surfactant molecules along the interface, resulting in a surface tension gradient and a Marangoni stress. The Marangoni stress acts to even out the surface tension gradient and to aid rebounding. Surfactant droplet ruptures the film with a much lower surfactant concentration, leaving an apparent dry region on the substrate at the impact point. This is likely due to Marangoni stresses where the film pulls the droplet apart. As the film thickness is increased, a Worthington jet is formed, with secondary droplet(s) ejected from the jet only when surfactants are present. This study reveals that the presence of surfactants can significantly alter the impact process of droplets on liquid films.

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