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Dynamics of drop coalescence on under-liquid substrates SURJYASISH MITRA, SUSHANTA MITRA, York University — Theoretical understanding of drop coalescence on under-liquid substrates is a challenging problem due to the presence of a surrounding viscous medium. Though, most work till date have focused on coalescence in air medium, the presence of a surrounding viscous medium is a significant extension to this classical coalescence problem. Such instances are often found in physical systems such as oil-spills, wetting of marine ecosystem, etc. In the present work, a modified one-dimensional lubrication equation has been developed to describe the early coalescence behavior of two symmetric sessile drops for under-liquid substrates, which takes into account the viscosities of both the drop and the surrounding medium. We found a new time scale which governs the process and there exist a cross-over time between the universal scaling of the bridge height growth $\hat{h} \sim \hat{t}$ (valid for both under-liquid and air) and a much slower bridge growth $\hat{h} \sim \hat{t}^{0.24}$occurring at a later time. It is also found that the evolving bridge profile has a self-similarity, which breaks up much earlier for under-liquid substrates as opposed to symmetric coalescence in air.

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