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Electro-induced manipulations of liquid marbles for chemical reactions ZHOU LIU, XIANGYU FU, Department of Mechanical Engineering, University of Hong Kong, BERNARD P. BINKS, Department of Chemistry, University of Hull, HO CHEUNG SHUM, Department of Mechanical Engineering, University of Hong Kong, MICROFLUIDICS AND SOFT MATTER GROUP IN UNIVERSITY OF HONG KONG TEAM, SURFACTANT AND COLLOID GROUP AT HULL TEAM — Liquid marbles, liquid droplets coated by non-wetting particles, have been well demonstrated as a promising template for various droplet-based applications, in particular for chemical reactions. In these applications, controlled manipulations on liquid marbles, including coalescence and mixing, are highly demanded but yet rarely investigated. In this work, we study the coalescence and mixing of liquid marbles controlled by an electric field. We found that a sufficiently large applied voltage can cause the coalescence of two or multiple marbles arranged in a chain. This critical voltage, leading to the consequent coalescence, increases with the number of the liquid marbles. In addition, the imposed electric stress can induce convective liquid flow within the different liquid marbles, resulting in rapid and efficient mixing. The mixing efficiency can be conveniently tuned through varying the applied voltage. Our approach based on electro-assisted manipulations of liquids marbles represents a robust and feasible template for chemical or biomedical reactions involving multiple reagents and steps. We have demonstrated its potential by performing a chemiluminescence to detect the hydrogen peroxide encapsulated in liquid marbles.

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