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Phase separation of a confined ionic-liquid – water mixture in a temperature gradient MARC PASCUAL, ALEXANDRE VILQUIN, ARTHUR POQUET, ESPCI Paris, MARIE-CAROLINE JULLIEN, IPR — Ionic liquids have remarkable properties and are commonly harnessed for green chemistry, lubrication and energy applications. In this paper, we study a thermoresponsive Water - Ionic Liquid (IL) binary mixture which has the property of phase separating above a critical temperature (LCST system). For this purpose, we generate a temperature gradient in a microfluidic cavity where the confinement strengthens wetting effects and enhances the demixing. We show that the phase separation is performed by the joint effects of sedimentation and thermocapillary actuation giving rise to a 3D flow structure, which is quantitatively captured by our model. Thermocapillary forces impose the droplets direction of migration, while interactions with the walls play also a crucial role: a micrometer-thick wetting layer which undergoes thermal interfacial transport gives rise to shear flows oriented toward the warmer side. Altogether those mechanisms lead to the accumulation of the wetting phase near the heating source. The universality of the phenomenon is demonstrated with a Water-Lutidine mixture. We believe this work will find applications in the recycling of ionic liquids.

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