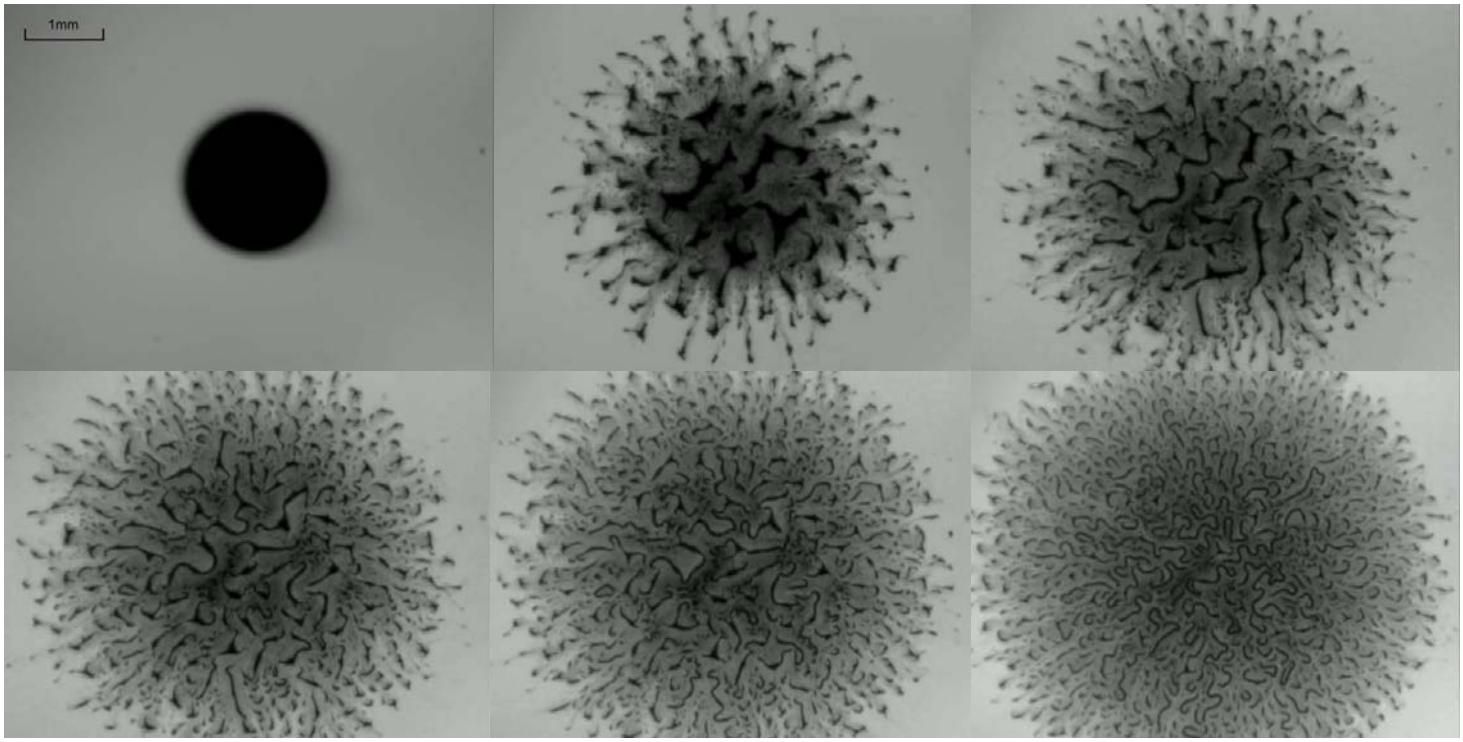

Interfacial instability of a miscible ferrodroplet immersed in a thin fluid layer

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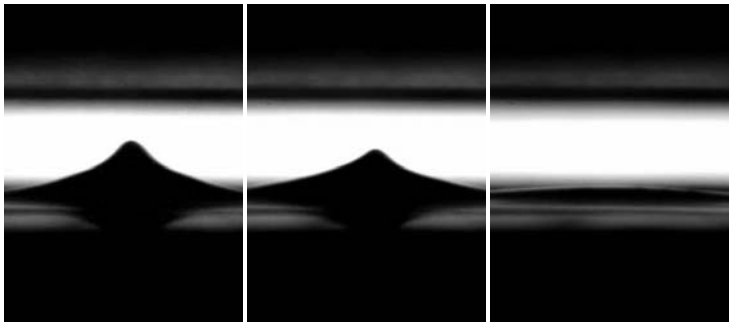
We perform experiments of the interfacial instability of a ferrodroplet immersed in a thin layer of miscible solvent and subjected a perpendicular uniform magnetic field. The ferrofluid experimented is a light mineral oil-based ferrofluid (Ferrotech EMG901). A ferrodoplet with a diameter of d=1.80 mm (measured by the top view) is initially placed in a cavity (depth h=0.43mm) filled with mineral oil. A magnetic field strength is applied by a pair of coils to trigger the interfacial instability. The sequential snapshots of top and side views are recorded by a CCD camera. Affected by the magnetic field, an interesting interfacial instability, which is a new mixed type of Rosensweig instability and miscible labyrinthine instability, is observed.



Initially, the droplet is lifted by the perpendicular field and forms a typical Rosensweig peak higher than the solvent surface along the field direction, as the sequential snapshots shown in the figure of side views. On the other hand, confined by the thin layer of solvent, labyrinthine fingers, which are attributed by the magnetization, are triggered on the plane of substrate, as shown in the figure of top views. Because of diffusion that weakens the local concentration of ferrofluid, height of the Rosensweig peak decays and serves as an injecting source to further enhance the labyrinthine fingers. Consequently, very vigorous fingering is resulted.

This research is supported by the National Science Council of the Republic of China through the grant NSC-95-2221-E-224-077-MY3 .