Simple and double emulsions via electrospray

ANTONIO BARREIRO, ALVARO G. MARIN, Universidad de Sevilla, IGNACIO G. LOSCERTALES, Universidad de Malaga — Generation of nanoemulsions is of great interest in medical and pharmaceutical applications; drug delivery or antiviral emulsions are typical examples. The use of electrosprays for dispersing liquids inside liquid insulator baths have been recently reported, (Barrero et al. J. Colloid Interf. Sci. 272, 104, 2004). Capsules, nanotubes and coaxial nanofibers have been obtained from electrified coaxial jets (Loscertales et al. Science 295, n. 5560, 1695, 2002; J. American Chem. Soc. 126, 5376, 2004). Here we present a method for making double emulsions (both water-oil-water and o/w/o) based on the generation of compound electrosprays inside insulator liquid baths. Basically, a conducting liquid injected throughout a capillary needle is electroatomized in cone-jet mode inside a dielectric liquid bath. A third insulating liquid is injected inside the Taylor cone to form a second meniscus. Then, a steady coaxial jet, in which the insulating liquid is coated by the conducting one, develops. A double emulsion forms as a result of the jet breaking up into compound droplets electrically charged. Experimental results carried out with glycerine and different oils in a bath of heptane are reported.