Abstract Submitted for the DFD14 Meeting of The American Physical Society

Nonlinear deformations of microcapsules in elongation flow JULIEN DESCHAMPS, CLÉMENT DE LOUBENS, GWENN BOEDEC, MARC GEORGELIN, MARC LEONETTI, Univ Aix-Marseille, SOFT MATTER AND BIOPHYSICS GROUP TEAM — Soft microcapsules are drops bounded by a thin elastic shell made of cross-linked proteins. They have numerous applications for drug delivery in bioengineering, pharmaceutics and medicine, where their mechanical stability and their dynamics under flow are crucial. They can also be used as red blood cells models. Here, we investigate the mechanical behaviour of microcapsules made of albumine in strong elongational flow, up to a stretching of 180% just before breaking. The set-up allows us to visualize the deformed shape in the two perpendicular main fields of view, to manage high capillary number and to manipulate soft microcapsules. The steady-state shape of a capsule in the planar elongational flow is non-axisymmetric. In each cross section, the shape is an ellipse but with different small axis which vary in opposite sense with the stretching. Whatever the degree of cross-linking and the size of the capsules, the deformations followed the same master-curve. Comparisons between numerical predictions and experimental results permit to conclude unambiguously that the more properly strain-energy model of membrane is the generalized Hooke model.

> Julien Deschamps Univ Aix-Marseille

Date submitted: 31 Jul 2014

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