

EFFECTIVE PROPERTIES OF RESONANT NANOPARTICLE SUSPENSIONS: IMPACT OF THE ELEMENTARY VOLUME SHAPE

Timothée Guerra¹, Iñigo González de Arrieta^{1,2}, Olivier Rozenbaum¹, Cédric Blanchard^{1*}

¹CNRS, CEMHTI UPR3079, Univ. Orléans, Orléans F-45071, France

²Physics Department, University of the Basque Country (UPV/EHU), Leioa E-48940, Spain

ABSTRACT. This paper is concerned with the homogenization of nanoparticle suspensions when resonant behaviors are involved, leading to unusual results, such as high incoherence or scattering. At first glance, this seems incompatible with homogenization, which only applies to the coherent part of the electromagnetic response of the suspension. Homogenization procedures must be based on averaging the response of many statistical samples of the suspension, characterized by their size and shape. The focus is on the effect of the agglomerate shape, which is explored by considering elliptical samples of the suspension of different aspect ratio; a section is devoted to the problem of scattering by an ellipse. We show that incoherence is not an intrinsic characteristic of a medium, but a function of its shape. Hence, it is possible to go from a restricted to an unrestricted homogenization just by changing the shape, which does not affect the resulting effective refractive index.

* Corresponding Author: cedric.blanchard@cnrs-orleans.fr.