Scanning Dielectric Microscopy Applied to Nanoscale Biosamples: beyond electrical nanocharacterization

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Abstract

Scanning Dielectric Microscopy (SDM) is an electric Atomic Force Microscope technique able to probe quantitatively the dielectric properties of nanoscale samples. [1] SDM combines the measurement of electrical forces acting on the measuring probe with finite element numerical calculations to provide local values of the dielectric and conductive properties of nanomaterials. The technique can be applied in both ambient and liquid conditions and hence enables the study of nanoscale biosamples in physiological conditions. In this communication I will review recent applications of the technique to the dielectric characterization of different biosystems of relevance in the context of nanomedicine including supported biomembranes [2], protein macromolecular structures [3], single liposomes [4], outer membrane bacterial nanoextensions [5] and single bacterial cells [6]. I will also present recent developments of the technique that enables going beyond electrical characterization to obtain also information on the nanomechanical properties [8], opening the door to multimodal nanocharacterization of nanobiosystems.

References

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Figures

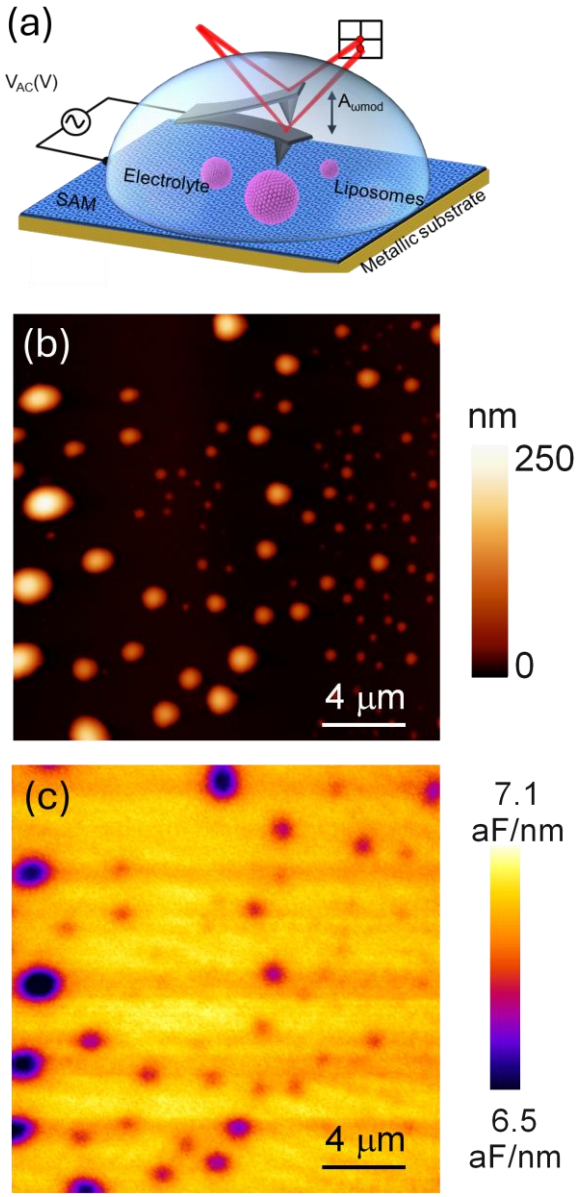

Figure 1. (a) Schematic representation of Scanning Dielectric Microscopy applied to single liposome nanoelectrical characterization. (b) and (c) Topographic and electrical images. [4]