LANGMUIR

Article

pubs.acs.org/Langmuir

Hydrophobic Silica Nanoparticles Induce Gel Phases in Phospholipid Monolayers

Davide Orsi,[†] Tiziano Rimoldi,[†] Eduardo Guzmán,[‡] Libero Liggieri,[‡] Francesca Ravera,[‡] Beatrice Ruta,[§] and Luigi Cristofolini*[,†,‡]

[†]Dipartimento di Fisica e Scienze della Terra, Università degli Studi di Parma, Parma, Italy

[‡]Consiglio Nazionale delle Ricerche - Istituto per l'Energetica e le Interfasi, U.O.S. Genova (CNR IENI), Genova, Italy

[§]ESRF-The European Synchrotron, CS 40220, 38043 Grenoble, Cedex 9, France

Supporting Information

ABSTRACT: Silica nanoparticles (SiNP) can be incorporated in phospholipid layers to form hybrid organic–inorganic bidimensional mesostructures. Controlling the dynamics in these mesostructures paves the way to high-performance drug-delivery systems. Depending on the different hydrophobicity/hydrophilicity of SiNP, recent X-ray reflectivity experiments have demonstrated opposite structural effects. While these are reasonably well understood, less is known about the effects on the dynamics, which in turn determine molecular diffusivity and the possibility of drug release. In this work we characterize the dynamics of a mixed Langmuir layer made of phospholipid and *hydrophobic* SiNP. We combine X-ray photon correlation spectroscopy and epifluorescence discrete Fourier microscopy to cover more than 2 decades of Q-range (0.3–80 μm^{-1}). We obtain evidence for the onset of an arrested state characterized by intermittent stress-relaxation rearrangement events, corresponding to a gel dominated by attractive interactions. We compare this with our previous results from phospholipid/*hydrophilic* SiNP films, which show an arrested glassy phase of repulsive disks.