Monodisperse gold nanorod for high-pressure refractive index sensing

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Abstract

This work investigates the surface plasmon resonance (SPR) of monodisperse gold nanorods (AuNR) aqueous solutions (10^{11} NP/cm^3) under high-pressure conditions. We show that the longitudinal SPR of AuNR (aspect ratio: 3.4) redshifts with pressure as a consequence of two competing effects: a blueshift induced by the increase of electron density due to AuNR compression, and a large redshift due to increase of the solvent refractive index [1]. Here we show that the LSPR pressure redshift can be explained within the Mie-Gans model [2] by changes of the refractive index *n* of the surrounding medium. These measurements unveil the suitability of AuNRs for refractive index sensing and detection of structural changes (water→Ice VI→Ice VII) as it is shown in Figure 1. The so-obtained *n*(*P*) data are compared with those measured by standard interferometric and spectroscopic techniques at high pressure [3]. We will show similar results using AuNR dispersed in methanol-ethanol mixtures, which enable us to widen the hydrostatic pressure range of the transmitting medium up to 11 GPa [1]. Interestingly, high-pressure induced solvent solifification yields notablt changes in the AuNR plasmonics.

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References

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Figures

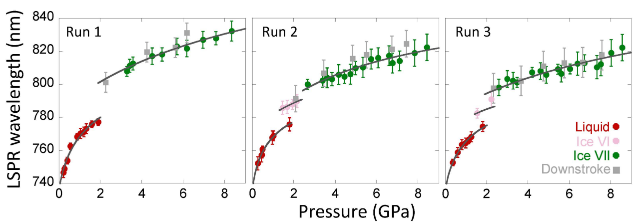

Figure 1: Pressure dependence of the LSPR band of AuNRs in aqueous solutions. The plots include experimental (filled circles) and calculated (solid lines) values of $\lambda_{LSPR}(P)$ using the Mie-Gans model.