



HAL
open science

Ligand-free synthesis of gold nanoparticles included within cylindrical block copolymer films

Patrick Guenoun, Florian Aubrit, Fabienne Testard, Frédéric Gobeaux, Xuan Wang, Virginie Ponsinet, Frédéric Nallet, Philippe Fontaine

► **To cite this version:**

Patrick Guenoun, Florian Aubrit, Fabienne Testard, Frédéric Gobeaux, Xuan Wang, et al.. Ligand-free synthesis of gold nanoparticles included within cylindrical block copolymer films. C’Nano 2017, Dec 2017, Lyon, France. cea-02328462

HAL Id: cea-02328462

<https://cea.hal.science/cea-02328462>

Submitted on 23 Oct 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L’archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d’enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

C'Nano 2017 - Call for proposals

Poster and Oral presentations

Presentation (chose one)

Oral presentation

Poster presentation

Symposium - For a poster presentation, chose one or several symposiums according to your research topic

Workshop "NanoBio" - Life Nanoscience and NanoBiotechnology

- NanoBio 1 - NanoBioAssembly
- NanoBio 2 - Imaging and Nanoprobes
- NanoBio 3 - Biosensors

Workshop "Nanomaterial" - Innovative Nanomaterials and Advance Characterization

- Nanomat 1 :
- Nanomat 2
- Nanomat 3

Workshop "NanoInWorld" : Nanosciences for a Sustainable World

- NanoInWorld 1
- NanoInWorld 2
- NanoInWorld 3 – Nano integration in society

Workshop "NanoPhot" – Nanophotonics

- NanoPhot 1 - Resonance & quantum nano-optics
- NanoPhot 2 – Emergent nanomaterials for nanophotonics

Title and affiliations (must fit in this box)**Ligand-free synthesis of gold nanoparticles included within cylindrical block copolymer films****GUENOUN Patrick¹, AUBRIT Florian¹, TESTARD Fabienne¹, GOBEAUX Frédéric¹, WANG Xuan², PONSINET Virginie², NALLET Frédéric², FONTAINE Philippe⁴**

1. LIONS, NIMBE, CEA, CNRS, Université Paris-Saclay, CEA-Saclay F-91191 Gif-sur-Yvette Cedex

2. Centre de Recherche Paul Pascal, Université de Bordeaux, UPR CNRS 8641, Pessac

3. Synchrotron SOLEIL, L'Orme des Merisiers, Saint-Aubin-BP 48, F-91192 Gif-sur Yvette Cedex

Abstract (No longer than 250 words. Both the abstract and references must fit in this box. Style is Calibri 12, single line spacing)

We report the inclusion of gold nanoparticles (AuNPs) without pre-functionalization step in oriented films of block copolymer poly(styrene)-b-poly(vinylpyridine) (PS-b-PVP) on a substrate. After deposition with an appropriate solvent, PS-b-P4VP and PS-b-P2VP are cast as films presenting either perpendicular and parallel cylinders. By including gold salt in these solutions and operating subsequent sonication, AuNPs (with a diameter of 2 nm) are synthesized and found located inside the cylinders of PVP after deposition of the film by spin-coating. Increasing the initial amount of gold precursors allows the formation of bigger AuNPs (d=4 nm). The seeded-growth of the pre-formed AuNPs was also achieved in order to get bigger AuNPs (d=8 nm) with plasmon resonance properties. This method was found more efficient in order to get bigger nanoparticles with a low quantity of gold precursor. The presence of AuNPs in the PVP domains disturbs the organization of the parallel cylinders, while it swells the PVP domains in the case of the perpendicular cylinders without changing their orientation. The formation of AuNPs inside a copolymer was also performed by radiolysis, through the irradiation of the copolymer solution and the copolymer film, both containing the gold salt, and led to similar results. The presence of plasmonic AuNPs of small diameter (~3-4 nm) was evidenced in both cases. GISAXS measurements are presented to characterize and compare the films order before and after gold inclusion, and help proving that cylinders are perpendicular to the substrate through the entire thickness.