Wigner 121
Scientific Symposium

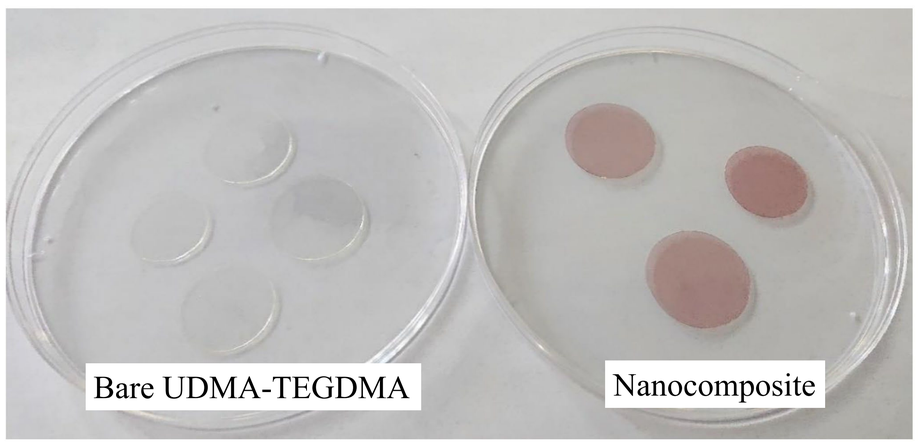
Wigner Research Centre for Physics
Institute for Solid State Physics and Optics
Applied and Nonlinear Optics Department
NAPLIFE Target Fabrication Group

Introduction

In this poster we present the fabrication technology and characterization of targets prepared for the NAPLIFE experiments. Gold nanorods (Au NRs) in different sizes and in different concentrations were added to a photopolymer matrix. Urethane dimethacrylates (UDMA) is one of the most widely used monomers in dental composites along with its low-molecular-weight diluent, triethylene-glycol dimethacrylate (TEGDMA). The UDMA-TEGDMA 3:1 copolymer was selected as a matrix to incorporate the gold nanorods for its many favourable properties (e.g. easy to structure, fast polymerization time etc.)

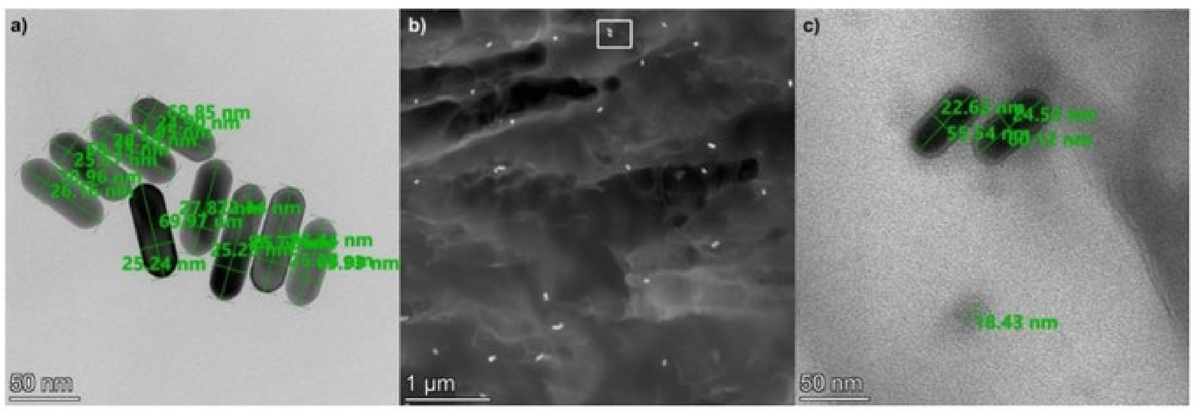
Method

Au nanorods in two different sizes, namely 25 nm x 75 nm and 25 nm x 85 nm (purchased from Nanoparts Co.) were added and dispersed in the photopolymerizable UDMA-TEGDMA (3:1 weight ratio) resin to create a nanocomposite. This nanocomposite resin was deposited onto a glass side with a frame to define the target thickness. Another glass slide was placed on top of the construction and the resin was photopolymerized with a blue dental curing lamp for 3 min exposure time.



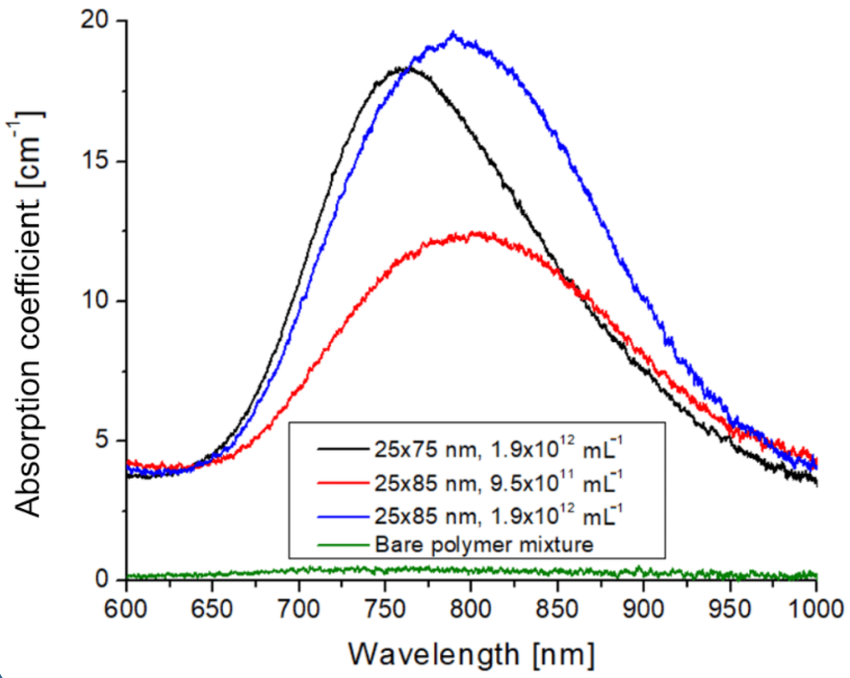
Publications of the group

[1] *The effect of femtosecond laser irradiation and plasmon field on the degree of conversion of a UDMA-TEGDMA copolymer nanocomposite doped with gold nanorods.* Bonyár, Szalóki, et. al. NAPLIFE Collaboration, International Journal of Molecular Sciences 23(21) Paper: 13575. (2022) (D1, IF=6.208)



Left: TEM images of the Au nanorods on a filter. Middle and right: TEM images of the nanorods inside the polymer matrix

Results



The sample were characterized with different methods::

- To check the homogeneity of nanorod implantation into the polymer matrix, scanning transmission electron microscopy (STEM) was used. The 25 x 75 nm sized Au nanorod concentration was estimated to be (1.9×10^{12} mL^{-1}) and the rod size was also verified.
- Based on the measured absorbance spectra, the LSPR peak of the 25 x 75 nanorods in the polymer matrix is around 760–765 nm, while the peak of 25 x 85 nanorods is around 795–800 nm.
- For the results of the laser irradiation experiments please see the publications of the research group, e.g. [1].

Nemzeti Kutatási, Fejlesztési és Innovációs Hivatal

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