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## AFM examination of sol-gel matrices doped with photosensitizers

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### Keywords

atomic force microscope (AFM), sol-gel material nanostructure, photosensitizers

### Abstract

Various compounds may be entrapped into the sol-gel materials, including the photosensitive agents. The nanostructure of the final material depends on the matrix itself, as well as on the structural properties of doped compound. In this work, sol-gel matrices were produced from silica based precursor tetraethoxysilan (TEOS) in the form of single layers deposited on microscopic glasses. Materials were produced with molar ratios  $R = 20, 32, 40$  ( $R$  - the number of solvent (ethanol) moles to the number of precursor (TEOS) moles). Additionally, for each material two various concentrations of photosensitizers were prepared (0.5 mg/ml and 0.05 mg/ml). On the basis of AFM images from Atomic Force Microscope Quesant 350, the following roughness parameters were evaluated: roughness average, peak-peak height, surface skewness and fractal dimension. The roughness average  $S_a$  parameter gives information about the statistical average properties. The peak-peak height  $S_y$  is defined as the height difference between the highest and the lowest pixel in the image. The surface skewness  $S_{sk}$  describes the asymmetry of the height distribution histogram. The fractal dimension  $S_{fd}$  is calculated for the different angles by analyzing the Fourier amplitude spectrum. Comparing the results we stated that average roughness increases with increasing  $R$  factor for protoporphyrine IX dimethylester (PPIX) (dimethyl-8, 13-divinyl-3, 7, 12, 17-tetramethyl-21H, 23H-porphine-2, 18-dipropionate) and photolon (18-carboxy-20-(carboxymethyl)-8-ethenyl-13-ethyl-2, 3-dihydro-3, 7, 12, 17-tetramethyl-21H, 23H-porphin-2-propionic acid) in higher concentrations. This means that photosensitizers used as dopants influence the smoothness of sol-gel matrix. We also noticed that the smallest roughness is observed in the material doped with PPIX in higher concentration. This was stated for all the images analyzed. This indicates that sol-gel matrix enclosures the PPIX molecules, resulting in smooth material.



270.3 kB

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