Poster

PLASMA PROCESSING OF PMMA FILMS FOR BIOMEDICAL APPLICATIONS

Claudia Nastase,[1] Anca Dumitru,[1] Florin Nastase,[1] Adina Morozan,[1]
Silviu Vulpe,[1] and Dan Batalu[2]
[1]Polymer Science Group, University of Bucharest,
P.O. Box MG-40 Magurele, Bucharest, 077125, Romania
[2]Center for Research and Expertise of Special Materials,
University Politehnica of Bucharest, Splaiul Independentei 313,
Bucharest, 060032, Romania

nastasec@psg.unibuc.ro

The polymer thin films have been used as biomaterial in medicine area from cardiovascular to plastic surgery. When a biomaterial implanted into a living tissue generate a cascade of host reactions occur at interface between tissue and material [1,2]. These reactions are known as inflammatory response. Proteins and blood cells from body fluids interact with the surface of the biomaterial; therefore the adsorption of proteins at the surface of the biomaterial is an important issue in its design [3,4]. Hence, an important goal in the design of biocompatible materials is to create surfaces that minimize unspecific interactions with biological material such as proteins and (blood) cells.

The different studies showed that plasma deposition processes could enhance the compatibility with blood of vascular grafts with small diameter. Plasma processing can be used to introduce desired functional groups or chains onto the surface of materials with particular application for improving the polymer film biocompatibility [5]. In this way a multitude of chemical substance, including that can not be polymerized by conventional methods, can be used for introducing specific functional groups on substrate. Moreover, the plasma treatment is a unique and powerful method for modifying polymeric materials without altering their bulk properties.

In this purpose we are using the plasma processing to enhance the properties of PMMA films for biomedical applications. Plasma processed PMMA thin films have been obtained in a DC glow discharge from polymer solution at different plasma powers. The results are compared with that for PMMA films obtained by deep coating method.

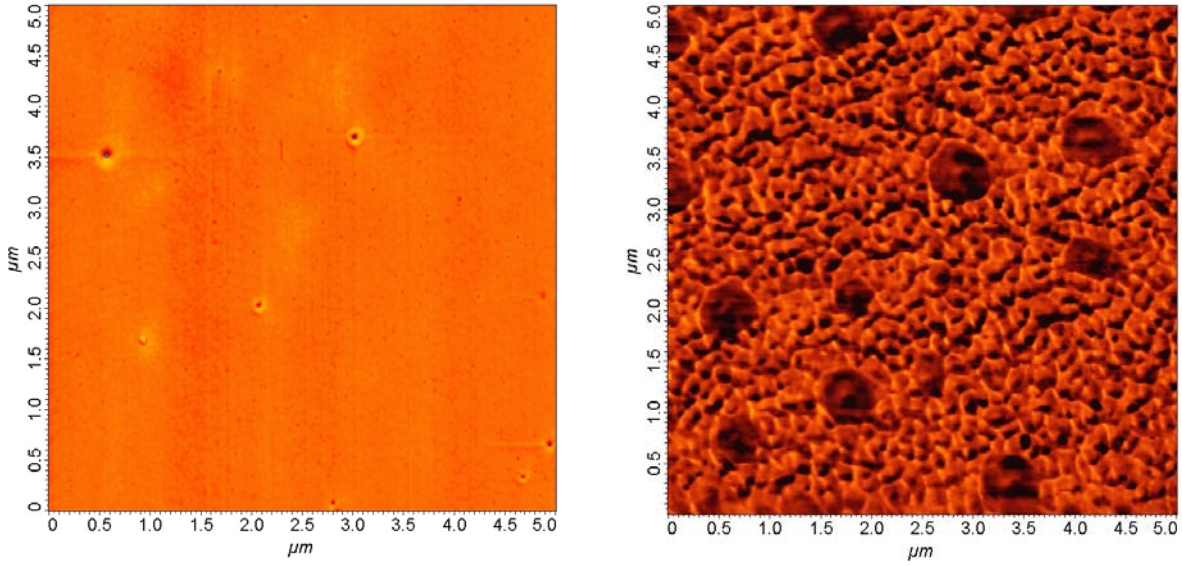
The structure and composition of the films have been characterized by Fourier Transform Infrared Spectroscopy (FTIR), Raman spectroscopy and atomic force microscopy (AFM). The surface modifications of PMMA films obtained with both methods proposed above have been evidence by noncontact mode AFM images (figure 1). It has also shown that the topography of PMMA surface was influenced by plasma parameters.

References:

[1] J.M. Anderson et al., in: B.D. Ratner, et al. (Eds.), Biomaterials—an Introduction into Materials in Medicine, Academic Press, San Diego (1996) p. 165.

[2] J.I. Gallin, R. Snyderman (Eds.), D.T. Feraon, B.F. Haynes, C. Nathan (assoc. Eds.), Inflammation: Basic Principals and Clinical Correlates, third ed., Lippincott Williams and Williams, Philadelphia (1999).
[3] C.R. Jenney, J.M. Anderson, J. Biomed. Mater. Res. 44 (1999) 206.
[4] Z. Xu, R.E. Marchant, Biomaterials 21 (2000) 1075.
[5] A. Karkhaneh, H. Mirzadeh, and A.R. Ghaffariyeh, Proceedings of the Fifth IASTED International Conference on Biomedical Engineering, BioMED 2007, pp.433-438, Innsbruck, Austria, February 14 – 16 (2007).

Figures:



a b

Figure 1. Noncontact AFM images of (a) deep coating PMMA film and (b) plasma processed PMMA film