2274-A-1902

Cold plasma activation of BPDA-PPD polyimide for improved biocompatibility

Laura Astoreca[1], Pieter Cools[1], Mahtab Asadian[1], David Schaubroeck[1,2], Heidi Declerq[1], Maaike Op de Beeck[1,2], Rino Morent[1], Herbert De Smet[1], Nathalie De Geyter[1]

[1] Ghent University, Ghent, Belgium
[2] IMEC, Leuven, Belgium

Polyimide is commonly used for packaging of medical devices due to its thermal and chemical stability, mechanical strength and flexibility and low moisture absorption [1]. Although it is known to be biocompatible [2], a cold plasma treatment has been applied for the activation of BPDA-PPD polyimide in order to enhance the interaction and integration of the device with the surrounding tissue to minimize the foreign body reaction after implantation. The influence of different parameters of the plasma activation on the surface composition of polyimide has been studied (exposure time, discharge power, plasma gas) as well as the hydrophobic recovery of optimal treatments over the 24 h following the exposure. For all gases (air, He, N2, Ar) short treatment times (1.0-32.0 s) and low discharge powers (1.5-3.0 W) revealed to be enough to introduce oxygen-containing functional groups, with an increase of 40-70% in the O/C ratio. Hydrophobic recovery stabilized fast (2.0-4.0 h after exposure) although the functionalities introduced onto the surface were not significantly affected. Eventually, it was confirmed that air or nitrogen plasma activation of polyimide can substantially increase fibroblasts attachment and viability, showing the potential of cold plasma treatment to improve the interaction of polyimide with the body tissue.

[1] Hassler, C., T. Boretius, and T. Stieglitz, Journal of Polymer Science, Part B: Polymer Physics, 2011, 1, 18-33.

[2] Rubehn, B. and T. Stieglitz, Biomaterials, 2010, 13, 3449-3458.