# Determination of the Optical Band Gap Energies of rGO/Metal Phthalocyanine/Polymer Nanocomposites

M. Prosheva,[a*] B. Ozmen-Monkul,[b] G. Gumus,[b] D. K. Taskin,[b] R. Tomovska,[cd] and J. Blazevska Gilev[a]

[a]*Faculty of Technology and Metallurgy, Ss. Cyril and Methodius University in Skopje, Ruger Boskovic 16 1000 Skopje, Macedonia*

[b]*TUBITAK Marmara Research Center, Life Sciences, P.O. Box 21, 41470 Gebze, Kocaeli, Turkey*

[c]*POLYMAT and Departamento de Química Aplicada Facultad de Ciencias Químicas University of the Basque Country, Joxe Mari KortaCenter - Avda. Tolosa, 72 20018, Donostia-San Sebastian, Spain*

[d]*IKERBASQUE, Basque Foundation for Science, 48011 Bilbao, Spain*

**marija@tmf.ukim.edu.mk*

Reduced graphene oxide/metal phthalocyanines (rGO/MPcs) are known for their outstanding optical properties. However, their synthesis is quite complicated and expensive with low material yields. Therefore, the aim of this research work was to investigate the option of placing this expensive material within polymer film and to study the optical properties of such polymer composites, in which low concentration of rGO/MPcs of 3wt.%. was added. rGO/MPcs hybrids were incorporated within polymer matrix by emulsion mixing technique. The optical properties of the obtained composite films were analyzed using ultraviolet – visible (UV-Vis) spectroscopy. It was observed that the absorbance of the composites was significantly increased compared to the neat polymer. From the UV-Vis spectra, the allowed and forbidden direct and indirect optical band gap energies were calculated. Compared to the neat polymer, the composites based on rGO/MPcs filler presented lower optical band gap energies. Specifically, the values of direct and indirect allowed band gap energies were reduced for 11.09% and 34.92%, respectively. The values of the direct and indirect forbidden band gap energies decreased for 25.81% and 39.80%, respectively. These results demonstrate the potential of the rGO/MPc/polymer composites to be used for development of optoelectronic devices.

**Keywords:** reduced graphene oxide, metal phthalocyanine, optical properties