Photoluminescent polymer aerogels based on poly(N-Isopropylacrylamide) - rare earth complexes

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Specify Technical Area: Applications in energy and photochemistry

Highly luminescent polymer aerogels used as photonic conversion mediums could be potentially interesting for applications in electronic devices\(^1\), especially for new approaches in energy efficient lighting sources. Our research team successfully prepared highly luminescent polymer aerogels based on poly(N-Isopropylacrylamide) - Eu\(^{3+}\), Tb\(^{3+}\) and Y\(^{3+}\) cations. Initially, we took advantage by the favorable molecular configuration of N-Isopropylacrylamide as a ligand for the previously mentioned cations. Therefore in the first step, 1/3 metal to ligand ratio complexes were prepared in aqueous medium. Further on, the resulted complex aqueous solution is mixed with N,N'-methylene bisacrylamide used as a crosslinker and polymerized in the presence of 2-Hydroxy-1-[4-(2-hydroxyethoxy)phenyl]-2-methyl-1-propanone as photoinitiator. The polymerization process undergoes at 240K in the presence of 310 nm UV radiation. The resulted cryogels were further freeze dried to obtain the photoluminescent polymer aerogels (Fig.1a,b). By simply varying the water content in the first preparation step, it is possible to obtain aerogels with controlled pore size. Our method permits the preparation of aerogels with any required shape and densities lower than 0.01 g/cm\(^3\). The morpho-structural investigation of the prepared photoluminescent aerogels were performed through FT-IR, TGA, SEM (Fig.1.c) and Fluorescence spectroscopy.

![Figure 1. The prepared poly(N-Isopropylacrylamide)-Tb\(^{3+}\) aerogel (a) under UV excitation, (b) in ambient lighting conditions, (c) SEM image of the aerogel](image)

References


Acknowledgements

This work was supported by a grant of the Romanian National Authority for Scientific Research, CNCS-UEFISCDI, Project Number PNIII-77PED/2017.