EuroSciCon

17th Edition of International Conference on

Emerging Trends in Materials Science and Nanotechnology

April 26-27, 2018
Rome, Italy

Aleksandra Ivanoska Dacikj et al., Nano Res Appl, Volume:4
DOI: 10.21767/2471-9838-C1-008

THE USE OF ELECTRON SPIN RESONANCE IN STUDYING THE SYNERGY BETWEEN ORGANIC AND INORGANIC COMPONENT IN HYBRID ELASTOMER BASED COMPOSITES

Aleksandra Ivanoska Dacikj[1], Gordana Bogoeva Gaceva[2] and **Srečko Valić[3]**
[1]Macedonian Academy of Sciences and Arts, Macedonia
[2]Ss. Cyril and Methodius University, Macedonia
[3]University of Rijeka, Croatia

Recently an increasing interest is becoming evident for incorporation of hybrid systems based on different fillers in elastomeric matrices. This leads to already confirmed benefits, regarding the properties of the nanocomposites, but jet some new aspects and methods are needed to reveal and understand the origin of the synergism between the nanofillers and its influence on the macroscopic properties. In this study electron spin resonance (ESR) investigations on hybrid natural rubber based nanocomposites loaded with 2 phr of multi-walled carbon nanotubes (MWCNT) and various amounts of expanded organically modified montmorillonite (EOMt) (0; 8 and 16 phr) were reported. The temperature dependence of resonance line parameters in the range 160–353 K was analyzed. From the obtained results it was evident that the presence of the EOMt influenced the appearance of the ESR spectra. The shape of the spectral lines was changed from Lorentzian one for the sample that does not contain EOMt to a Dysonian line for the sample that contains the highest amount of EOMt. This was in good correlation with the argument that the type of the ESR spectra line is closely connected to the state of dispersion of the CNT in the matrix. Also the values of the g-factor were shifted, from the values close to that of the free electron for the sample that does not contain EOMt to higher values with the increase of EOMt content. The observed behavior of the double integral of the resonance spectra was not temperature invariant, suggesting that it does not obey a simple Pauli law behavior. Therefore, it was assumed that the observed ESR signal originated not only from the metallic but also from the intrinsic conduction electrons in MWCNT and defects with an odd number of vacant carbon sites in the honeycomb configuration that can also introduce spins.

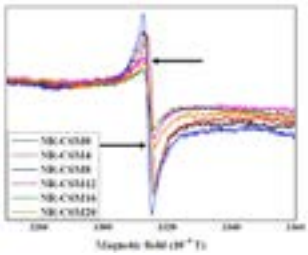

Figure 1: The ESR spectra of 6 phr MWCNT in NR-based nanocomposites containing different quantities of EOMt, at room temperature. Lorentzian shapes of the resonance spectra prove the good dispersion of the nanotubes within the NR matrix, regardless of the presence of EOMt.

Recent Publications

1. **Ivanoska-Dacikj A, Bogoeva-Gaceva G and Buzarovska A (2015) Clay improved dispersion of carbon nanotubes in different solvents. Contributions, Section of Natural, Mathematical and Biotechnical Sciences 36(1):5-10.**
2. **Ivanoska-Dacikj A, Bogoeva-Gaceva G, Rooj S, Heinrich G and Wießner S (2015) Fine tuning of the dynamic mechanical properties of natural rubber/carbon nanotube nanocomposites by organically modified montmorillonite: A first step in obtaining high-performance damping material suitable for seismic application. Applied Clay Science 118:99-106.**
3. **Ivanoska-Dacikj A, Bogoeva-Gaceva G, Wießner S and Heinrich G (2016) Rheometric and dynamic mechanical analysis of complex natural rubber based composites. Contributions, Section of Natural, Mathematical and Biotechnical Sciences 37:5-14.**

4. Ivanoska-Dacikj A, Bogoeva-Gaceva G, Jurk R, Wießner S and Heinrich G (2017) Assessment of the dynamic behavior of a new generation of complex natural rubber based systems intended for seismic base isolation. Journal of Elastomers and Plastics 49:595-608.
5. Ivanoska-Dacikj A, Bogoeva-Gaceva G, Valić S, Wießner S and Heinrich G (2017) Benefits of hybrid nano-filler networking between organically modified montmorillonite and carbon nanotubes in natural rubber: experiments and theoretical interpretations. Applied Clay Science 136:192-1198.

Biography

She has three years of working research experience at the Research Centre for Environment and Materials in Macedonian Academy of Sciences and Arts in Skopje. She is specialized in Elastomeric Nanocomposites. She has published six research papers in scientific journals and one book chapter.

aivanoska@manu.edu.mk