

Kinetics of the non-isothermal degradation of POSS/EPDM Hybrids Composites

T. Zaharescu^{1,2}, I. Blanco³, M. Catauro⁴

¹ INCDIE ICPE CA, Radiochemistry Center, 313 Splaiul Unirii, 030138 Bucharest, Romania

² ROSEAL SA, 5A Nicolae Bălcescu, 535600 Odorheiu Secuiesc, Romania

³ Department of Civil Engineering and Architecture and UdR-Catania Consorzio INSTM, University of Catania, Viale Andrea Doria, 6, 95125 Catania, Italy

⁴ Department of Engineering, University of Campania "Luigi Vanvitelli", Via Roma 29, I-813031 Aversa, Italy;

corresponding: traian.zaharescu@icpe-ca.ro

Keywords. Kinetics of degradation, EPDM, POSS, radiation

Abstract

Due to its chemical composition, ethylene-propylene-diene monomer (EPDM) exhibits important properties such as chemical resistance, good crystallinity and thermal stability, high elasticity, insulating properties and processability, high elasticity, abrasion and corrosion resistance. The simultaneous presence of all these features make it the ideal candidate for use, both in industrial and domestic sectors [1]. EPDM has been used for seals or tubes and hoses in the automotive industry, which accounts for the largest quantities of these materials, EPDM is very well suited also for applications in the food and beverage sector. Due to its excellent chemical resistance against detergents and cleaning solutions and its high abrasion resistance, EPDM is superbly suited for use in domestic appliances. In addition, EPDM rubber has been used in hard radiation environment due to its high resistance to environmental effects compared to other types of rubbers, thus making it one of the most studied materials in the area of polymer degradation [2-4]. EPDM's structure contains fully saturated bonds in the main chain with lack of quaternary carbon atom and double bonds pendant to the main chain thus making it crosslinkable under ionizing radiation [2]. The need to expand EPDM useful life in kinds of severe environments led the researchers to exploit its highly filled feature. Among the different studied possibilities of reinforcing the virgin material, Polyhedral oligomeric silsesquioxanes (POSSs) showed interesting results [5-7]. In this study, changes in the kinetics degradation of EPDM reinforced with a series of different mono phenyl, hepta isobutyl POSS, irradiated with different dose rates in oxidative and inert environment were investigated and compared with the virgin and non-irradiated polymer.

References

- [1] M. Xue, X. Zhang, L. Ma, Z. Gu, Y. Lin, C. Bao, X. Tian. *J. App. Polym. Sci.* **2013**, 128(4), 2395.
- [2] F. Hacıoglu, T. Ozdemir S. Cavdar, A. Usanmaz. *Rad. Phys. Chem.* **2013**, 83, 122.
- [3] T. Zaharescu, R. Setnescu, S. Jipa, T. Setnescu. *J. App. Polym. Sci.* **2000**, 77(5), 982.
- [4] T. Zaharescu I. Blanco, F.A. Bottino. *App. Surf. Sci.* **2020**, **509**, 144702.
- [5] K- S. Lee, Y- W. Chang. *Polym. Eng. Sci.* **2015**, 55(12), 2814.
- [6] B. Du, J. Su, M. Tian. *Scientific Reports* **2018**, 8(1), 8481.
- [7] T. Zaharescu. *J. Therm. Anal. Cal.* **2019**, 138, 2367.