# RAD 7

# BOOK OF ABSTRACTS

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# The influence of network precursor ratio on the crosslinking and radiation resistance of hybrid elastomeric materials

**Slaviša Jovanović[1], Jaroslava Budinski-Simendić[1], Milena Marinović-Cincović[2], Gordana Marković[3], Vesna Teofilović[1], Dejan Kojić[4], Nevena Vukić[1], Vojislav Jovanović[5]**

1 University of Novi Sad, Faculty of Technology, Novi Sad, Serbia
2 University of Belgrade, Institute of Nuclear Science Vinča, Belgrade, Serbia
3 Factory Tigar, Pirot, Serbia
4 University of Business Engineering and Management, Faculty of Engineering, Banja Luka, Bosnia and Herzegovina
5 University of Priština, Faculty of Natural Science and Mathematics, Kosovska Mitrovica, Serbia

Materials selected in nuclear processing plants are required to have radiation, thermal and chemical resistance. From experiments on different elastomeric seals materials it was assessed that after a high energy gamma treatment tremendous degradation of properties and compression set exist. Two common network precursors that are used in nuclear power plants are based on ethylene propylene diene rubber (EPDM) and chlorosulfonated polyethylene (CSM). Elastomeric materials based on CSM have good resistance to temperature extremes and chemicals but poor compression set and poor fuel resistance, which is limitation for its sealing application. Blending with other rubbers can improve these properties. *Polar* CSM rubber can interact with their active functional groups ($-SO_2Cl$) via substitution or condensation reactions. Hydrocarbon origin of EPDM completely saturated chains (without none double bond that imparts an excellent resistance to ozone, weathering, heat, oxidation and polar fluids) are able to absorb more energy without cracking polymeric chain (thus it is classified as radiation-resistant). EPDM rubbers are used in radiation areas for wire coating materials and electrical cables, due to their good resistance to environmental effects. This work aims to the study the influence of network precursor ratio on crosslinking behaviour and radiation resistance of hybrid materials based on CSM/EPDM and high abrasion carbon black particles (iodine adsorption value 82 g/kg). Rubber compounds were prepared using two-roll mill at 40 $^{o}$C to obtain sheets, which were pressed at 160 $^{o}$C during 20 minutes at pressure of 16 MPa. Optimal crosslinking time was determined by moving die rheometer (type MDR2000). It was assessed that the optimum curing time of obtained materials increases with increasing content of CSM. The radiation of prepared hybrid materials was carried out using 60Co gamma source with the dose rate 10 kGyh$^{-1}$ and different total absorbed dose (100, 200 and 400 kGy) at ambient temperature. For blends of two rubbers with dissimilar polarity, distribution of crosslink point can be non-equal through phases. Mechanicals properties and swelling properties were estimated for non-radiated and radiated samples. It was assessed that during radiation process, tensile strength, modulus and hardness and of prepared materials increased, but elongation at break decreased up to dose of 200kGy.