OPTIMIZATION OF ELECTRON BEAM CROSSLINKING OF WIRE AND CABLE INSULATION

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The computer simulations based on Monte Carlo method and the ModeCEB software program were carried out in connection with EB radiation set-up for crosslinking of electrical wire and cable insulation, located at the Center for Radiation Research and Technology of the Institute of Nuclear Chemistry and Technology [1]. The theoretical predictions for absorbed dose distribution in irradiated electrical wire and cable insulation caused by scanned EB were compared to the experimental results of irradiation which were carried out in the experimental set-up based on ILU 6 electron accelerator, which is characterized by the following parameters:

- Electron energy 0.5-2.0 MeV,
- Average beam current 40-10 mA, pulse duration 400 μs,
- Width of scanning up to 80 cm,
- Scan frequency up to 50 Hz.

The computer simulation of the dose distributions in two-sided irradiation system by a scanned electron beam in multilayer circular objects was performed for different process parameters: electrical wire and cable geometry (thickness of insulation layers and cupper wire diameter), type of polymer isolation, electron energy, energy spread, geometry of electron beam and electrical wire and cable distribution at irradiation zone. The geometry of electron beam distribution in irradiation zone was measured using TVA and PVC foil dosimeters for electron energy range available in ILU 6 accelerator. The temperature rise of irradiated electrical wire and irradiation homogeneity were evaluated for different experimental conditions to optimize process parameters. The obtained results of computer simulation were supported by experimental data of dose distribution based on gel-fraction measurements. Such agreement indicates that computer simulation ModeCEB is correct and sufficient for modeling of absorbed dose distribution in multi-layer circular objects irradiated with scanned electron beams [2].

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References

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