COMPARISON OF DIFFERENT MODELS FOR SPHERULITIC GROWTH EVALUATION IN FIBER-REINFORCED POLYMER COMPOSITES

Gordana Bogoeva-Gaceva and Anita Grozdanov
Faculty of Technology and metallurgy, Rugjer Boskovic 16, 1000 Skopje

Physico-mechanical properties of thermoplastic composites (TPC) have been controlled by the microstructure which is determined by crystallization conditions of semicrystalline polymer matrix. Microstructure is defined by the geometry of the spherulites nucleated in the matrix, *i.e*. their size, shape and boundaries. The nucleation and grain-growth conditions in polymer composites are different from those in neat polymers. Different approaches for microstructure and grain-boundary analysis have been proposed, such as the statistical methods, the intercept method, Voronoi method, mean field theory, as well as many computer simulations and models. Using these methods, the effects of fibers, spherulites size and shape distribution in the final microstructure of TPC at various nucleation conditions can be predictied.

In this paper, comparison of different models for the spherulitic growth evaluation in fiber-reinforced composites was done. For that purpose, UD composites based on iPP and C fibers with different surface size have been analysed. The spherulites morphology data were obtained by polarizing light microscopy, optical reflection microscopy and SEM.

Comparison of the obtained results has covered several parameters, such as spherulite area, *A* topological class, *n,* spherical aberration, *K*, spherulites shape factor, *Rm,* spherical elongation, *e.* Also, the relationship of the average radirus and areas of n-side grains on the topological class have been compared and they have shown excellent linear dependance which is in agreement with the theoretical one. Presented results have clearly shown that all these models, primary developed for polycrystalline metals, could be successfully applied for microstructural analysis of polymers and polymer based materials.