CONTENS

A method of thermomechanical spectrometry (TMC) is used to study a molecular-topological structure of polyamide doped with nano-inclusions of metal-complexes – Mo $(CO)_6$, $Co(AcAc)_3$, $Ni(AcAc)_3$, $W(CO)_6$ various concentration. In initial specimens of Pa-6 an anisotropic, amorphous-crystalline pseudo-network structure of high degree of crystallinity and large molecular weight was found. Experimental data obtained from a thermomechanical analysis (TMA) by using a method of block averaging the values of molecular weight of chains between junctions in a pseudo-network of an amorphous block and in chains of a crystal phase. The TMA of polyamide under the conditions of various orientations of orientation vectors of the directions of the thermomechanical loading and flow of a stream during its formation reveals complete isotropy of the topological structure of Pa-6.

An addition in melted Pa-6 of complexes mentioned affects the process of recrystallization at cooling in various ways. Polymer molecular-topological structure also changes. Its molecular weight of averaged over blocks increases proportionally to the concentration of knots of a branching cluster and a crystal structure approaching a maximum value corresponding to their weight volume no higher than 0.03 (p. 20-48; fig. 16).

Delamination initiation and propagation in a fibrous composite laminate, in single and mixed modes, are analysed numerically taking into account an existence of imperfect interfaces between the lamina. The bonding conditions between lamina are characterised by jumps in displacements, which are proportional to the tractions. In order to describe the interface damage, two approaches are implemented in a finite element analysis. One approach is based on the indirect use of fracture mechanics considering a softening stress-relative displacements. The second approach is based on a failure criterion written as a the Coulomb law. An accuracy of the predictions is evaluated by executing single mode delamination tests, mixed-mode bending test, and a structural configuration consisting of the debonding of a woven laminated composite reinforced by particles of date cores for orthopaedic use (p. 49–63; fig. 9).