INVESTIGATION OF KINETIC REGULARITIES AND CHEMISTRY OF ISOPROPENYL PHENOL WITH FORMALDEHYDE OLIOMERS HARDENING


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The present work is devoted to the study of polycondensation of p-isopropenyl phenol with formaldehyde, as well as mixture of phenol and p-isopropenylphenol with formaldehyde and to the study of chemistry of synthesized oligomers.

Polycondensation of phenol, p-isopropenyl phenol with formaldehyde was carried out in mass at 95-100°C in the presence of alkaline and weak-acidic catalysts.

Some kinetic regularities of polycondensation of p-isopropenyl phenol and phenol with formaldehyde in the presence of zinc acetate have been investigated by chromatographic method, and reaction rate constants for p-isopropenyl phenol (k=0,87·10^{-2} kg/mole-min) and phenol (k=1,05·10^{-2} kg/mole-min) have been determined.

Influence of various parameters on polycondensation of p-isopropenyl and mixture of phenol and p-isopropenylphenol with formaldehyde in the presence of sodium hydrate and zinc acetate catalysts has been studied.

The study of physico-chemical properties of the synthesized oligomers showed that number of methylene groups, viscosity and molecular weight of synthesized oligomers increase with increasing of formaldehyde concentration in the starting mixture in the presence of both sodium hydrate catalysts and zinc acetate, in the presence of latter jellification time decreases.

Structure of oligomers have been investigated by IR- and NMR \(^1\)H and \(^{13}\)C-spectroscopy.

It is shown that oligomers, obtained by polycondensation of p-isopropenyl phenol and by copolycondensation of phenol and p-isopropenyl phenol mixture with formaldehyde in the presence of sodium hydrate almost didn't contain methylene ether fragments.

Kinetic regularities and thermal hardening process chemistry of synthesized oligomers have been studied using plastometer "Brabender" at 140°, 160° and 180°C. On the basis of obtained data rate constants and activation energy of hardening reaction have been determined.

For elucidation of hardening process chemistry IR-spectra of the hardened and starting oligomers have been taken.

Results of kinetic, differential thermogravimetric researches (DTP-D) and as well as double linear dilatometry (DAD) allow to assume that forming radicals in thermal fission of dimethylene ether bonds initiate polymerization of isopropenyl groups which provides higher hardening rate of oligomers in the presence of zinc acetate as compared with oligomers, synthesized in the presence of alkali.