

Polymeric binding, containing hexanitrohexaazaisowurtzitane

© Vladimir N. Popok,^{*†} Yury A. Pivovarov, and Nikolay I. Popok

Joint Stock Company «Federal Research and Production Center «ALTAI». Sotsialisticheskaya St., 1. Biysk, 659322. Altai Territory. Russia. Phone: +7 (3854) 30-19-37. E-mails: vnpopok@mail.ru

*Supervising author; †Corresponding author

Keywords: hexanitrohexaazaisowurtzitane, binding, dissolution, polymers, thermal decomposition, viscosity, vitrification, IR-spectroscopy.

Abstract

Results of testing of properties binding on the basis of the polyurethane polymer and inert polar softeners modified by dissolution of a hexanitrohexaazaisowurtzitane in them are presented in article. The basic option binding polyurethane/triacetine contains triacetine as softener. Hexanitrohexaazaisowurtzitane forms molecular complexes with wide group of softeners (solvents) and polymers, including with triacetine and polyurethane, containing various polar functional groups. Binding polyurethane/triacetin, earlier studied in the cocrystals and thermoreversible compositions with hexanitrohexaazaisowurtzitane, includes 20% of mass. polymer and 80 % of mass. softener. At the maintenance of a hexanitrohexaazaisowurtzitane ~ 20-25 % of mass. in the form of solution in binding polyurethane/triacetine a crystal phase at temperature variation in the range from -20 to 80 °C at long storage (up to 40-100 days) samples in isothermal conditions aren't formed. Temperature of melting of a triacetine of 3°C. For comparison the analog this binding with replacement of a triacetine on frost-resistant (temperature of melting minus 42 °C) softener triethylacetyltriate which doesn't form cocrystals with hexanitrohexaazaisowurtzitane is used. The maximum maintenance of a hexanitrohexaazaisowurtzitane in binding corresponded to the content of polymer in mixes (20 % of mass.) and in a firm complex polyurethane/hexanitrohexaazaisowurtzitane (~50 % of mass.). Weak dependence of solubility of a hexanitrohexaazaisowurtzitane on temperature at formation of complexes with components of binding has allowed to carry out modification of the acceptable technical and operational characteristics, binding with increase in density, an enthalpy of education, oxygen balance with preservation, including safety. It is shown that dissolution of a hexanitrohexaazaisowurtzitane in binding leads to increase in their viscosity and energy of activation of a viscous current in the range of temperatures from 20 to 60 °C. Values of temperature of vitrification binding increase a little at dissolution of a hexanitrohexaazaisowurtzitane, but are in the range from minus 40 to minus 70 °C that allows to use them when developing frost-resistant power compositions. Results of the analysis of features of thermal decomposition and IR-spektoscopy of binding are presented.