
Fracture strength of epoxy binders modified by thermoplastic polysulfone and furfural-acetone resin

© M.N. Kopitsyna, I.V. Bessonov, S.V. Kotomin

Bauman Moscow State Technical University, Moscow, 105005, Russia

The paper continues researches into modification of bisphenol epoxy resin using heat resistant thermoplastic polymers and reactive diluents, i.e. furfural-acetone resin, in order to improve epoxy resin properties for polymeric composites. It is shown that viscosity of such blend compounds is greatly reduced in comparison with epoxy resin containing only one polysulfone additive at the same glass transition temperature of the cured binder. A combined impact of both polysulfone additives and furfural-acetone resin on mechanical properties of the cured binder, in particular on fracture strength, is studied. Both the fracture strength and material morphology in the fracture zone of the cured binder are analyzed. The modified binder is shown to have higher fracture strength at the current heat resistance. The obtained results will be useful for a wide range of professionals dealing with polymeric composite technology as well as structures based on them.

Keywords: polymer compounds, micro-defects, fracture strength, thermoplastics, epoxy resin, polysulfone

REFERENCES

- [1] Downey A.M., Drzal L.T. *Polymer*, 2014, vol. 55 (26), pp. 6658–6663.
- [2] Gorbunova I.Yu., Shustov M.V., Kerber M.L. *Inzhenerno-Fizicheskii Zhurnal — Journal of Engineering Physics and Thermophysics*, 2003, vol. 6, no. 3, pp. 1–4.
- [3] Bejoy F., Geert V.P., Fabrice P., Sabu T. *Polymer*, 2003, vol. 44, pp. 3687–3699.
- [4] Solodilov V.I., Korohin R.A., Gorbatkina Yu.A., Cooperman A.M. *Khimicheskaya fizika — Journal of Physical Chemistry B: Focus on Physics*, 2012, vol. 31, no. 6, pp. 63–71.
- [5] Solodilov V.I., Gorbatkina Yu.A. *Mekhanika kompozitnykh materialov — Mechanics of Composite Materials*, 2006, vol. 42, no. 6, pp. 739–758.
- [6] Cooperman A.M., Zelinsky E.S., Kerber M.L. *Mekhanika kompozitnykh materialov — Mechanics of Composite Materials*, 1996, vol. 32, no. 1, pp. 111–117.
- [7] Bessonov I.V., Kopitsyna M.N., Nelyub V.A. *Zhurnal obschei khimii — Russian Journal of General Chemistry*, 2014, vol. 84, no. 12, pp. 2023–2028.
- [8] Bessonov I.V., Polezhaev A.V., Kuznetsova (Kopitsyna) M.N., Nelyub V.A., Buyanov I.A., Chudnov I.V., Borodulin A.S. *Klei. Germetiki. Tekhnologii — Adhesives. Sealants. Technologies*, 2013, vol. 6, no. 4, pp. 29–33.
- [9] Bessonov I.V., Kopitsyna M.N., Polezhaev A.V., Nelyub V.A. *Klei. Germetiki. Tekhnologii — Adhesives. Sealants. Technologies*, 2015, no. 9, p. 24–29.
- [10] Polezhaev A.V., Bessonov I.V., Nelyub V.A., Buyanov I.A., Chudnov I.V., Borodulin A.S. *Entsiklopediya inzhenera-khimika. Intensifikatsiya khimiko-tekhnologicheskikh protsessov — Encyclopedia for chemical engineer. Intensification of chemical-technological processes*, 2013, no. 1, pp. 36–43.
- [11] Solodilov V.I., Korokhin R.A., Gorbatkina Yu.A., Cooperman A.M. *Mekhanika kompozitnykh materialov — Mechanics of Composite Materials*, 2015, vol. 51, no. 2, pp. 253–272.

Kopitsyna M.N. (b. 1990) graduated from Lomonosov Moscow State University in 2012. A post-graduate student, Bauman Moscow State Technical University. Author of

15 publications. Research interests include synthesis and study of polymer composite materials, qualitative and quantitative analysis, instruments of thermal and structural analysis. e-mail: mariankuznetsova@gmail.com

Bessonov I.V. (b. 1984) graduated from Lomonosov Moscow State University in 2006. A post-graduate student, Bauman Moscow State Technical University. Author of 19 publications. Research interests: polymer composites. e-mail: ivanbessonov@gmail.com

Kotomin S.V. (b. 1952) graduated from Dmitry Mendeleev Moscow Institute of Chemical Technology in 1974. Dr. Sci. (Chem.), Professor, Department of Chemistry, Bauman Moscow State Technical University; Senior Staff Scientist, Institute for Petrochemical Synthesis, Russian Academy of Sciences. Author of 120 publications. Research interests include physical chemistry, processing polymers and composites. e-mail: svk1952@gmail.com