ISSN 1068-798X, Russian Engineering Research, 2017, Vol. 37, No. 10, pp. 925–928. © Allerton Press, Inc., 2017.
Original Russian Text © I.F. Gumerov, A.F. Gumerov, A.V. Lakhno, L.N. Shafigullin, S.Yu. Yurasov, G.R. Shafigullina, 2017, published in STIN, 2017, No. 5, pp. 34–37.

Glass-Filled Polyurethane Materials Produced by Fiber Composite Spraying

I. F. Gumerov*, A. F. Gumerov, A. V. Lakhno***, L. N. Shafigullin****, S. Yu. Yurasov*****, and G. R. Shafigullina******

Naberezhnye Chelny Institute, Kazan Federal University, Naberezhnye Chelny, Russia
*e-mail: misharin_82@mail.ru
**e-mail: mtk_ineka@mail.ru
***e-mail: Lakhnopenza@mail.ru
****e-mail: krit8181@mail.ru
*****e-mail: docfile@yandex.ru
******e-mail: krit8181@mail.ru*

Abstract—By using polymer composites in auto parts, the vehicle mass may be considerably reduced, with improvement in the dynamic properties and load capacity of the vehicle and also in its fuel consumption and tailpipe emissions. In the present work, recommendations are made for improving the performance of glass-filled polyurethane materials produced by fiber composite spraying. To that end, the thermal stability, impact strength, high-temperature strength, and Shore D hardness are determined in accordance with Technical Specifications TU 2292-010-14682925–2014. The sound absorption and UV resistance of the composites are also determined.

Keywords: glass-filled polyurethane composites, fiber composite spraying, consumer properties

DOI: 10.3103/S1068798X17100100

Polymer composites offer valuable consumer properties: high unit strength; resistance to aggressive media (water, fuel–lubricant mixtures, weak alkalis and acids); a broad operational temperature range (from −60 to +80°C); reasonable life (up to ten years); and pleasing appearance [1–11]. By using polymer composites in auto parts, the vehicle mass may be considerably reduced, with improvement in the dynamic properties and load capacity of the vehicle and also in its fuel consumption and tailpipe emissions.

Polymer composites are used both in the exterior and interior of automobiles: in the exterior, it is utilized for the sunroof, the rear hatch, the grille, the engine cover, housings of the headlights, fog light, and tail lights, the bumpers, door trim, and the fenders; in the interior, it is employed in the choke housing, the frontal structural units, audio-system conduits, door hinges, transmission components, doorframe reinforcement, transverse structural elements, gas cylinders, acoustic mats, bumper reinforcements, longitudinal suspension arms, drive shafts, sheet springs, engine components (the crank–piston group), the instrument panel, the door facings, the heater housings, the central console housing, seals, gas tanks, and air valves [3].

Various technologies are used to produce components from polymer composites: SCS, LFI, LFI-PUR, BMC, Stamp Form, R-RIM, PolySet, IMC, Fiber-Form, FiberForm WIT, SkinForm, FCS, RRIM, SRIM, and RTM [4, 5].

Depending on the maximum working temperature, polymer composites are classified as standard polymers operating up to 100°C (polyethylene, polypropylene, acrylonitrile butadiene styrene (ABS), polyurethane, polymethyl methacrylate, etc.); structural polymers operating up to 150°C (polyamide, polycarbonate, etc.); and high-temperature compounds operating up to 300°C (organosilicon compounds, etc.).

In the development of new structural polymer composites, researchers have become aware that polyurethane composites, traditionally classed as standard polymers, may be used as structural materials if their structure is modified.

In the present work, we investigate parts made of rigid glass-filled polyurethane materials. Samples are produced on the basis of polyol and isocyanate components. The filler is fiberglass roving (25 parts by mass for each 100 parts of the matrix). The glass-filled polyurethane parts are produced by fiber composite spraying [5].