Flexible polyurethane foams containing thermoregulatory polymer polyether polyol.

Irene Izarra, A.M Borreguero, I. Garrido, M. Carmona, J.F. Rodríguez*
Chemical Engineering Department, University of Castilla-La Mancha, Institute of Chemical and Environmental Technology, ITQUIMA, Avda. Camilo José Cela s/n, 13004, Ciudad Real, Spain.
**Corresponding author. Tel: 926295300 Ext: 6345. E-mail address: Juan.RRomero@uclm.es*

Keywords: flexible PU foams, nanocapsules, polymer polyether polyols, thermal and mechanical properties.

Abstract.

The thermal storage capacity of flexible polyurethane foams (FPUs) was studied by incorporating a thermoregulatory polymer polyether polyol (T-PPP) containing polyurea nanocapsules as shell and paraffin RT-27 as phase change material (PCM). FPUs containing 0.625, 10, 12.5 and 20 pph of T-PPP in the FPUs formulation with a 40 wt.% of nanocapsules were synthesized. The influence of T-PPP in the foam density, hardness, porosity, microstructure, thermal and mechanical resistance was studied. The densities of the foams varied from 33.82, 34.98, 39.28, 41.04 and 44.58 kg/m3 for 0.625, 10, 12.5 and 20 pph of T-PPP, correspondingly, and consequently the porosity sharply decreased while the hardness raised with T-PPP concentration. Cell size and morphology were analyzed by SEM, observing a change in cell structure from closed polyhedral cells to spherical or amorphous open cells. According to the porosity values the FPUs were considered as a tight foams. Instead, the incorporation of this T-PPP in the FPUs structure caused an increase in thermal storage capacity of 2,58, 3,56, 4,53 and 7,30 J/g for 0.625, 10, 12.5 and 20 pph of T-PPP, respectively. Finally, the incorporation of T-PPP into the FPUs produced a considerable improved in the remaining deformation properties, an improvement in tensile strength when 10 and 12.5 pph of T-PPP were employed, and a detriment in the elongation values when T-PPP concentration was increased.
Considering structural, thermal and mechanical properties, the FPUs containing 12.5 and 20 pph of T-PPP in the FPUs formulation was the optimal condition chosen for being applied in automotive sector.