Thermoforming of extrusion foamed cellulose acetate she...

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Keywords

cellulose acetate; thermoforming; packaging

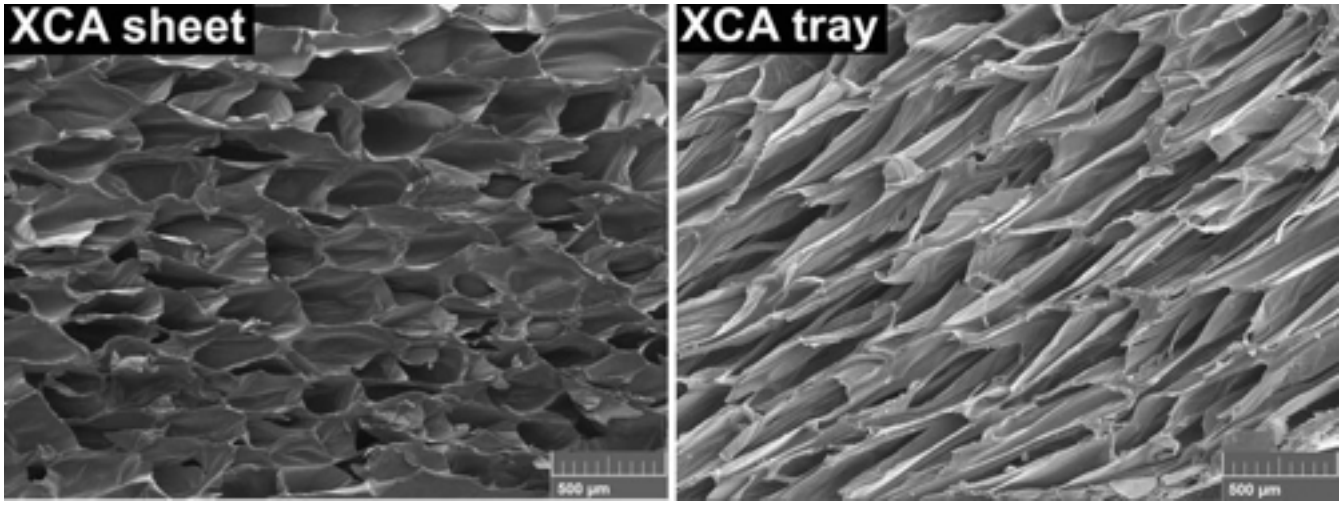
Topic

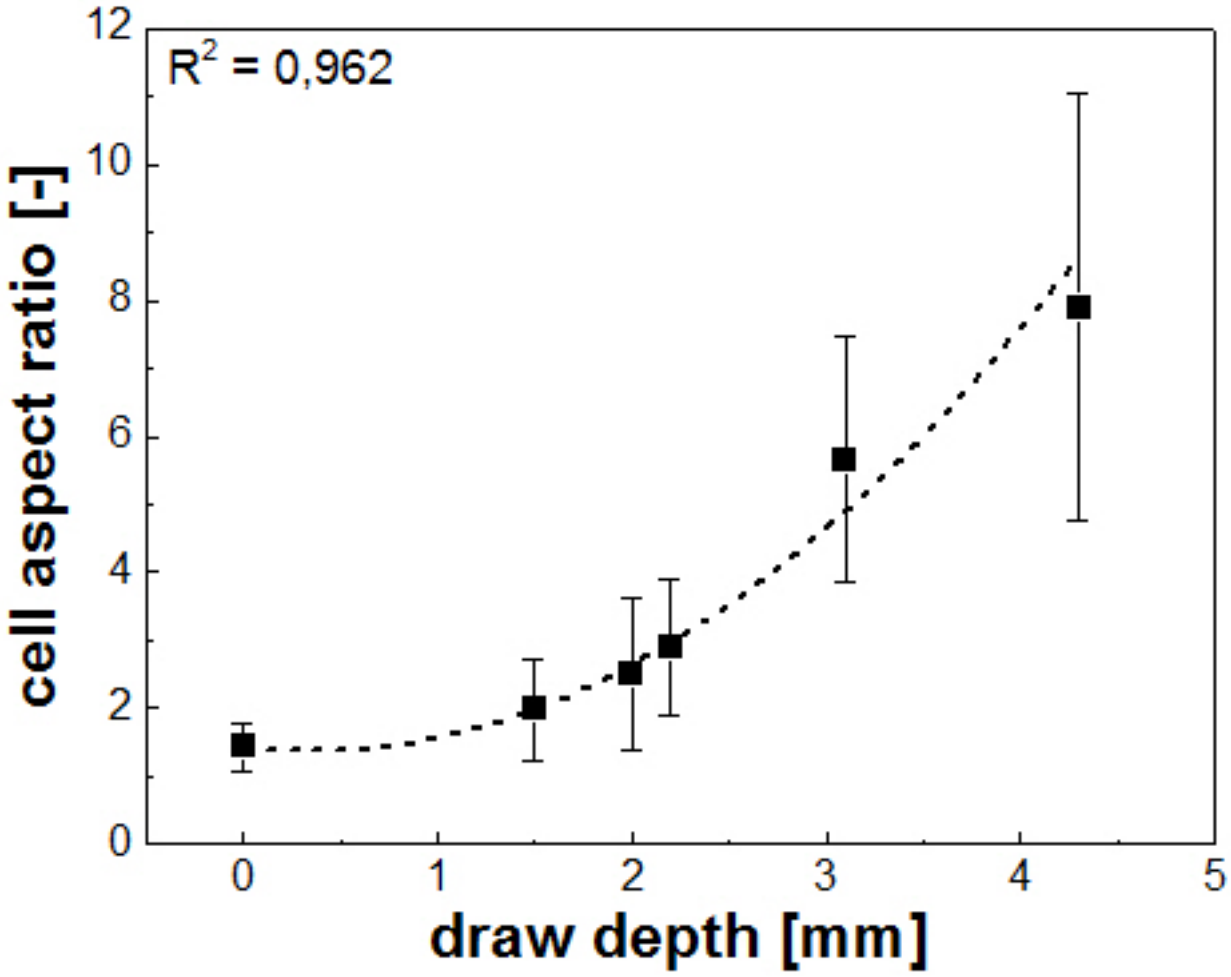
Foam for advanced applications

Abstract

Broad processing window and good melt rheology makes polystyrene (PS) the predominant polymer for producing extruded foams for various applications including insulation boards or thermoformed packaging. However, the use of renewable resources, the reduction of packaging waste, and the minimization of emissions becomes more and more important my. Cellulose acetate (CA), as an organic cellulose ester, is a biodegradable and bio-based polymer. Thermoplastic CA exhibits properties comparable to those of neat PS and can be successfully processed into extrusion foamed sheets. However, limited attention has been drawn to the thermoforming process of extrusion foamed sheets. The poster will show recent results of the thermoforming behavior of extrusion foamed CA sheets. Trays with different shapes and different draw ratios were produced using an industrial thermoforming machine. The morphology and surface quality of the trays were studied qualitatively and quantitatively by means of scanning electron microscopy and confocal microscopy. Cell anisotropy was analyzed in dependence of the draw ratio by measuring the aspect ratio of the cells. Thermal properties of the trays were measured using differential scanning calorimetry, thermogravimetric analysis, and VICAT softening temperature. In addition, chemical resistance against common vegetable oils and fats were studied under different temperature and moisture conditions. Foamed

CA Trays with optical and haptic properties similar to foamed PS trays can be produced. However, the draw ratio and shape of the tray have significant influence on the quality and morphology (e.g. cell anisotropy). The foamed CA trays have furthermore sufficient heat stability and chemical resistance.


XCA sheet
500 µm
XCA tray
500 µm


R² = 0,962
cell aspect ratio [-]
draw depth [mm]
0
2
4
6
8
10
12
0
1
2
3
4
5