

Fabrication of large area, curved electrochromic modules for automotive application

M. Mennig*, S. Heusing, P. Zapp, N. Niegisch, H. Schmidt

Institut für Neue Materialien, Im Stadtwald 43, 66123 Saarbrücken, Germany,

Sunroof-like, cured electrochromic modules with sizes of 310 mm x 420 mm x 7 mm and a bending radius of 2000 mm (curve height 12 mm) have been fabricated by the sol gel technique. Fluorine doped tin oxide coated glass panes (TEC 8, $8 \Omega/$) of 3 mm thickness have been bent at 600°C for 15 min using a metallic mould. The bent glass panes were coated with WO₃ and CeO₂-TiO₂ layers by dip coating and subsequent thermal treatment at 240°C for 1 h and 450°C for 15 min respectively. The coated glass panes were mounted using an 1,1 mm thick organic-inorganic composite electrolyte [1, 2] by sealing, filling and curing at 105°C for 12 h.

The module shows a switchable transmission between 66 % in the bleached and 22 % in the coloured state. The switching times for 80 % of the total transmittance change are only 45 s for colouring (-2,1 V), and 55 s for bleaching (1,9 V).

The intensity and the kinetics of colouring and bleaching of the module are very homogenous. This is attributed to the homogeneous coating thickness and high ionic conductivity of the electrolyte (10^{-5} S/cm), which allows high electrolyte thicknesses (1,1 mm). Therefore, thickness variations of the electrolyte, which cannot be avoided using bent substrates, can be neglected.

The modules show a very good memory effect (more than 24 h without significant transmission change without electric power). No degradation or delamination is observed after 1000 h UV Test (765 W/m²) or thermal treatment at -35°C (2 h) and 120°C (2 h).

More than 30.000 cycles have been run without decay of the optical performance. Due to these properties and the good homogeneity, the modules, offer a very interesting potential for application in automotive sunroofs.

* corresponding author

tel. (+49) (0)681/9300-394, fax(+49) (0)681/9300-223, email: mennig@inm-gmbh.de