

Abstract

ALL POLYMERIC FLAT-PLATE COLLECTOR – POTENTIAL OF THERMOTROPIC LAYERS TO PREVENT OVERHEATING

Katharina Resch¹, Gernot M. Wallner², Robert Hausner³

¹ *Polymer Competence Center Leoben, Parkstrasse 11, A-8700 Leoben, Austria, resch@pccl.at*

² *University of Leoben, Institute of Materials Science and Testing of Plastics, Franz-Josef-Str. 18, A-8700 Leoben, Austria, wallner@unileoben.ac.at*

³ *AEE-INTEC Feldgasse 19, 8200 Gleisdorf, Austria, r.hausner@aee.at*

The main objective of the present study was to evaluate the potential of thermotropic layers to provide overheating protection in solar collectors by theoretical modeling of an all-polymeric solar panel. For that purpose model calculations were carried out to determine the effects of thermotropic glazings on overall solar collector performance and on required solar transmission, switching temperature and switching behavior of the thermotropic layer.

The investigations showed that the maximum absorber temperatures can be limited by thermotropic glazings. In general the impact of the thermotropic layer on collector efficiency is insignificant, as long as the solar transmission is above 85% in the clear state. Collectors with twin-wall sheet covers were found to be best suited in combination with thermotropic layers. As to thermotropic layer design for this collector configuration a residual hemispherical solar transmittance ranging from 25 to 60% in opaque state is effectual to control the stagnation temperatures in the range from 80 to 130°C. For maximum working efficiency a rapid and steep switching process and switching temperatures between 50 and 60°C are required.

For the full text contact the author(s) or the publisher:

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