



“Gheorghe Asachi” Technical University of Iasi, Romania



MULTI-CRITERIA METHODS FOR SELECTION OF ENCAPSULATION MATERIALS FOR PHOTOVOLTAIC CELLS

Gabriela Demian^{1*}, Luminita Grecu², Mihai Demian¹

¹*University of Craiova, Faculty of Mechanics, 200585 Craiova, Romania*

²*University of Craiova, Department of Applied Mathematics, 200585 Craiova, Romania*

Abstract

In this paper we applied multi-criteria methods of decision in order to establish the best encapsulation material to be used in producing photovoltaic modules. The encapsulation materials play an important role in establishing the PV module performance, especially if referring to their ability to increase their life time. For our study, we have considered the most widely used encapsulation materials available on the market, such as Ethylene-Vinyl Acetate (EVA), Polyvinyl Butyral (PVB), Thermoplastic Polyurethane (TPU), PolyDimethylsiloxane (PDMS), Ionomer. Amongst of their basic properties, we took into consideration the light transmittance, refractive index, thermal conductivity, volume resistivity, and water vapor transmission rate. In the paper herein, two multi-criteria methods, namely the Simple Additive Weighting method and ELECTRE (ELimination and Choice Expressing Reality) method are applied in order to establish a hierarchy of the mentioned encapsulation materials. It is also shown that the final hierarchy of materials depends on the importance given to the criteria involved. By considering all the mentioned properties and the economical aspect, in particular the cost, the first position in the hierarchy is occupied by EVA. If the cost is eliminated, the hierarchy changes and EVA becomes outranked by other materials, as PDMS and Ionomer.

Key words: ELECTRE method, encapsulation materials, materials properties, PV module, Simple Additive Weighting method

Received: November, 2015; Revised final: May, 2016; Accepted: October, 2016

* Author to whom all correspondence should be addressed: e-mail: gabrielademian@yahoo.com; Phone: +40744567864