

Optimal methodologies for delaminating End-of Life crystalline silicon solar photovoltaic panels

ABSTRACT

The increasing usage along with various programs introduced by the Malaysian government for solar energy will lead to a surge in the disposal of defective solar modules. Recycling of defective or End-of-Life (EoL) solar modules becoming the sustainable solution instead of direct disposal to the landfill. Layering structure of built-in solar module often hinders the recycling process. Efficient and cost-effective methodologies must be identified for delaminating the modules which include physical separation and thermal treatment. This is to assure each material comprised in the solar module such as glass, metal scrap, silicon, and plastic could be retrieved and processed for further usage. Besides layering structure, crystalline silicon solar module often encapsulated by ethyl vinyl acetate (EVA) for preventing degradation of performance. Identifying the optimal conditions specifically temperature and duration during thermal treatment are necessary to remove EVA encapsulation between each layer of solar module. Accordingly, applying heat from 150 – 200 within 30s - 2min are the optimal conditions for detaching adhesiveness of EVA encapsulation and delaminating the layering structure of solar module that is unachievable solely through the physical separation. Besides, the utility cost of the proposed thermal process remained minimum. This study indicates the proposed methodologies are capable of delaminating damaged or EoL solar module for recycling and retrieving valuable materials purposes.