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APPLICATION OF HYBRID PHOTOVOLTAIC/THERMAL SOLAR SYSTEMS TO BUILDINGS

Abstract: *Photovoltaic/thermal (PV/T) hybrid technology has been intensively developed over the last few decades. Nowadays, this technology is very popular in terms of harvesting solar energy. Hybrid photovoltaic/thermal (PV/T) solar systems convert solar energy into electricity and heat with a single device which is a good advancement for future energy demands. This report presents the review of applications of photovoltaic thermal (PV/T) solar systems as building integrated photovoltaic/thermal (BIPV/T) systems. This report also covers research works on future development of a PV/T collector as a building integrated photovoltaic/thermal (BIPVT) system.*

Keywords:*Hybrid solar systemsBuilding,Building integrated photovoltaic/thermal systems*

1. INTRODUCTION

Hybrid photovoltaic/thermal (PV/T) solar systems consist of PV modules coupled into water or air heat extraction devices, which convert the absorbed solar radiation into electricity and heat [1]. During the last 30 years different types of solar thermal collectors and new materials for PV cells have been developed for efficient solar energy utilization, [2]. A number of theoretical and experimental studies referred to hybrid PV/T systems with air and/or water heat extraction from PV modules, and some of the works that follow the first period of PV/T system development are [3,4,5].

A thermal system and an electrical system combined and integrated into buildings are known as building integrated photovoltaic–thermal system (BIPV/T). PV/T solar collector can be installed on the roof as a roofing material and to wall as a wall material, [6]. Therefore, the cost of the building construction, and also the payback period of the building can be reduced.

The first studies regarding building integrated PV/T systems included considerations and practical results of these systems, [7,8]. Further, the monitoring results from a BIPV PV/T system that operates during winter for space heating and during summer, [1], for active cooling are given in [9].

A dynamic thermal model for a building integrated photovoltaic–thermal system, the Mataro Library building, near Barcelona, had been developed in [10]. Some interesting modeling results on air cooled PV modules, for applying BIPV/T concept in Southern China are given in [11]. A thermal system combined with photovoltaic cells and integrated into building is considered in [12]. Results showed that the concept of BIPV/T is capable of achieving energy payback periods between 4 and 16.5 years. A novel