Power Generating Ceramic Tile With Body-Integrated Solar Cells for Any Surface

Background of the Invention

Field of the Invention

The invention pertains generally to solar panels. More specifically, the invention relates to a ceramic solar integrated tile with new architecture and improved efficiency that can be used for all surfaces universally.

Description Of Prior Art

Solar panels are well-known-for capturing solar energy and converting the energy into electric power. Solar panels are devices that convert light into electricity. Such panels can be used in rooftop and ground mounted solar plant application to produce clean energy. A solar panel is a collection of solar cells. Lots of small solar cells spread over a large area can work together to provide enough power to be useful. The more light that hits a cell, the more electricity it produces.

A PV module consists of a number of interconnected solar cells encapsulated into a single, long-lasting, stable unit. The key purpose of encapsulating a set of electrically connected solar cells is to protect them and their interconnecting wires from the typically harsh environment in which they are used. For example, solar cells, since they are relatively thin, are prone to mechanical damage unless protected. In addition, the metal grid on the top surface of the solar cell and the wires interconnecting the individual solar cells may be corroded by water or water vapor. The two key functions of encapsulation are to prevent mechanical damage to the solar cells and to prevent water or water vapor from corroding the electrical contacts.

Many different types of PV modules exist, and the module structure is often different for different types of solar cells or for different applications. For example, amorphous silicon solar cells are often encapsulated into a flexible array, while bulk silicon solar cells for remote power applications are usually rigid with glass front surfaces.

The most common modules have either 60 cells or 72 cells with three bypass diodes. 60 cell modules were originally designed for ease of handling in residential applications and heavier 72 cell modules for large utility installations where cranes and hydraulic lift are available.

Brief Description of The Drawings

FIG. 1 Layered Architecture
FIG. 2 Packaged Architecture
FIG. 3 Module Interconnection
FIG. 4 Module Variant
FIG. 5 Negative Tab
FIG. 6 Positive Tab
FIG. 7 Sealant for two terminals
FIG. 8 Sealant for single terminal
FIG. 9 Ceramic Casting
FIG. 10 Glass

With reference to the drawings and, in particular, with reference to FIG 1, the power generating ceramic tile, is an integrated solar ceramic tile. It has components from top in sequence glass (3), negative tab (2), solar cells (3), positive tabs (6), sealant to hold the cells and tabs (7), ceramic casting 1. and terminals on body with terminal sealant (7).

As particularly shown in FIG 2, ceramic casting (2) holds all the components. Ceramic casting (2) has positive terminal (7) and negative terminals (6) on body. Positive tab (1), cells (3), negative tabs (5), are inside the casting.

FIG 3, has the electrical interconnection and functional architecture of power generating ceramic tile. In single tile all the positive tabs are connected in parallel and terminated at positive terminals. Positive terminal is inserted to adjacent ceramic tiles negative terminal. Similarly negative tabs are connected in parallel and terminated at negative terminals. Negative terminal is connected to adjacent ceramic tile's positive. The power generating ceramic tile has all the cells connected in parallel. There is series connection between adjacent ceramic tiles.

FIG 5 refers to negative tab within power generating ceramic tile. All the cells have negative tabs on edges above the cell. All cells are connected in parallel. Negative tab is terminated at negative terminal. Tabbing above the cells creates the shadow on the cells which reduces efficiency of cell. Power generating ceramic tile has the tabbing on the edges of solar cell, which will lead to less shadow on solar cell and more efficiency

FIG 6 refers to positive tab within power generating ceramic tile. All the cells have positive tabs on edges below the cell. All the cells are connected in parallel. Positive tab is terminated at positive terminal. Positive tab and negative tabs are designed such that it does not overlap.

FIG 9 refers to the ceramic casting which has a trench 3 between outer edge 1 and inner edge 5. The trench holds the glass. Solar cells and tabbing embedded in ceramic with sealant which provides better mechanical strength. Better isolation provided to conducting materials. There will be no ground failure. Ceramic gives holds the terminals on side edges. Glass seal will be there between ceramic and the terminals which will give more strength to terminals. There will be isolation between ceramic and terminals. Terminals are mounted on side walls which are easy to connect with adjacent ceramic tile.

FIG 10 refers to the glass. The glass has the edge which goes inside the trench (1) of the ceramic casting. There is no glue between cell and glass as well as no lamination which will allow the radiation to fall on cell without any obstacles, leading more efficiency.

Explanations of the Advantages of Invention Compared to Prior Art:

Category	Power generating ceramic tile	Prior art
Casted Ceramic Base:	1. Power generating ceramic tile has the ceramic casting frame which provides mechanical strength to all the components inside. 2. The casting is non conducting and has the high di-electric strength. 3. Power generating ceramic tile has no chances of grounding and earthing failure. 4. Ceramic provides good heat dissipation which reduces the	1. Metallic frame and polymer back sheet is used in conventional modules that cannot allow for application on all types of surfaces and is prone to fire and degradation overtime. 2. It may cause grounding or earthing failure leading to short-circuit and damage. 3. Conventional module has poor dielectric strength.

	thermal damage to cells and improves the performance leading to higher outputs 5, The ceramic tile format allows for multiple such tiles to be placed on the wall, ground, or any surface whatsoever, like traditional tiles without any additional mounting structures	4. Heat causes cracks on solar cells and hotspots are created on cell leading to drastic fall in output. 5. Additional mounting structures are needed to attach the solar modules to the roof that also leaves a gap , that causes water to get stuck
Boundary busbar:	1. The Power generating ceramic tile has the tabbing on solar cells edges. 2. Positive tabs and negative tabs are in perpendicular to each other. 3. Tabbing do not overlap. 4. Tabbing shadow impact is less.	1. Conventional solar cells do not have tabbing on edges. 2. Negative tabs and positive tabs are parallel to each other. 3. Tabs on solar cells creates shadow.
	1. All the solar cells in the Power generating ceramic tile connected in parallel, i.e., all positive tabs are interconnected and all the negative tabs are interconnected.	1. Adjacent cells has the series connection, i.e., positive tabs are connected to negative tabs.
	1. Power generating ceramic tile can have only series connection with the adjacent tile. 2. The phoka yoke mechanism implemented to avoid the human errors. There are no chances of wrong interconnection.	1. Conventional module can be connected in parallel or series with adjacent modules. 2. The user may do wrong connection leading to short circuit, damage and accident.
Vacuum Gap between glass and cell:	1. Power generating ceramic tile has no lamination and chemical glue between glass and cell. 2. Solar irradiation's intensity do not get lowered as there are no obstacles in between.	1. Conventional module has lamination and chemical glue between glass and solar cell. 2. The lamination and chemical glue act as obstacle reduces the irradiation intensity.

Glass seal and terminal:	1. Power generating ceramic tile has body mounted terminal. 2. Phoka yoke mechanism is implemented for terminals so wrong connection will not be possible even accidently	1. Conventional module has wired connector (MC4 connector)which requires space below the module 2. The untrained user may connect it in wrong way leading to short-circuit and damage
	1. Power generating ceramic tile has no extra junction box mounted on body.	1. Conventional module has junction box on back side.
	1 Terminals are isolated from body with glass seal. 2. Glass seal provides mechanical strength to terminals. 3. Glass seal eliminates the grounding and earthing failure possibilities.	1. Conventional modules terminals have no such glass seal and are susceptible to ground and earth faults.

Claims:

1. A casted ceramic tile designed as a trench to hold the solar cells resting on sealants that is inserted into boundary trenches of the casted ceramic tile.