incorporates single crystal silicon, of the type used in silicon solar cells, together with the perovskite structure or other solar cell material. In some examples, a key feature of the MCSC is that it is not limited to specific solar cell technologies, it is intended to be applicable to most if not all such constructions.

[0013] Regardless of the specific solar cell technology used in the MCSC, the flexible solar module examples may share the general properties of being sufficiently flexible to conform to surfaces of low to moderate curvature and being constructed from a massively interconnected network of individual independent solar cell capsules.

[0014] Another example where sacrificing areal power efficiency by intentionally spacing SCCs apart from one another has distinct advantages is in producing solar panels that have an effective porosity that reduces wind loading, increases cooling, and reduces areal weight density and allows the passage of sunlight through the solar panel. Spacing SCCs apart from one another on a porous mesh, net, screen, or lattice allows free air flow between and about SCC units. It also may allow sunlight to penetrate the panel and reach the ground behind the panel. Problems solved by the porous nature of some examples of the disclosure include overheating of solar panels, loss of cultivated land, and environmental damage associated with traditional solar farms.

[0015] Disclosed herein is a solar cell assembly comprising at least one substrate including a top surface; a plurality of solar cell capsules affixed to the top surface of the at least one substrate such that a plurality of continuous gaps is defined between adjacent solar cell capsules of the plurality of solar cell capsules; one or more solar cell units contained in at least one of the plurality of solar cell capsules, wherein the solar cell units are contained in an encapsulant to protect the solar cell units from one or more of water and oxygen molecules, atmospheric pollutants, dirt, soot, and strong chemicals or by mechanical abrasion, impact, UV light, and temperature; and a plurality of electrical conductors interconnecting the solar cell capsules one to another to form an electrical circuit.

[0016] Disclosed herein is a method comprising forming a solar cell assembly, the solar cell assembly comprising at least one substrate including a top surface; a plurality of solar cell capsules affixed to the top surface of the at least one substrate such that a plurality of continuous gaps is defined between adjacent solar cell capsules of the plurality of solar cell capsules, wherein each of solar cell capsules of the plurality of solar cell capsules includes one or more solar cell units, wherein the one or more solar cell units are contained in an encapsulant to protect the solar cell units from one or more of water and oxygen molecules, atmospheric pollutants, dirt, soot, and strong chemicals or by mechanical abrasion, impact, UV light, and temperature; and a plurality of electrical conductors interconnecting the solar cell capsules one to another to form an electrical circuit.

[0016a] According to an aspect of the present disclosure, there is provided a solar cell assembly including: a rigid frame defining an array of connected support structures with open spaces between respective support structures of the rigid frame, the open spaces being configured to allow air and sunlight to pass through the rigid frame; a plurality of solar cell capsules separated from each adjacent solar cell capsule of the plurality of solar cell capsules by a gap aligned with the open spaces between respective support structures, wherein each solar cell capsule of the plurality of solar cell capsules includes at least one photovoltaic solar cell encapsulated by with a polymeric material, the polymeric material protecting the at least one photovoltaic solar cell solar cell against damage from water molecules, oxygen molecules, and chemicals, and wherein the at least one photovoltaic solar cell of each of the plurality of solar cells are electrically connected to each other to establish an electric circuit for generation of electricity from light.

[0017] This summary is intended to provide an overview of the subject matter described in this disclosure. It is not intended to provide an exclusive or exhaustive explanation of the assemblies and methods described in detail within the accompanying drawings and description below. Further details of one or more examples are set forth in the accompanying drawings and the description below. Other features, objects, and advantages will be apparent from the description and drawings, and from the statements provided below. The disclosure is not limited by the embodiments that are described herein. These embodiments serve only to exemplify aspects of the disclosure.

BRIEF DESCRIPTION OF DRAWINGS

[0018] The following drawings are illustrative of example embodiments and do not limit the scope of the disclosure. The drawings are not to scale (unless so stated) and are intended for use in conjunction with the explanations in the following detailed description. Examples will hereinafter be described in conjunction with the appended drawings wherein like numerals denote like elements.

[0019] FIG. 1a is a conceptual diagram illustrating a side view of an example single encapsulated SCC unit as defined and described in the disclosure.

[0020] FIG. 1b is a conceptual diagram illustrating a top-down view of the single encapsulated SCC unit of FIG. 1a.

[0021] FIG. 2 is a conceptual diagram illustrating an example flexible MCSC assembly in accordance with some examples of the disclosure. As described below, the MCSC assembly may include an array of SCC units affixed to a

CLAIMS

1. A solar cell assembly comprising:

a rigid frame defining an array of connected support structures with open spaces between respective support structures of the rigid frame, the open spaces being configured to allow air and sunlight to pass through the rigid frame;

a plurality of solar cell capsules separated from each adjacent solar cell capsule of the plurality of solar cell capsules by a gap aligned with the open spaces between respective support structures, wherein each solar cell capsule of the plurality of solar cell capsules includes at least one photovoltaic solar cell encapsulated by with a polymeric material, the polymeric material protecting the at least one photovoltaic solar cell solar cell against damage from water molecules, oxygen molecules, and chemicals, and

wherein the at least one photovoltaic solar cell of each of the plurality of solar cells are electrically connected to each other to establish an electric circuit for generation of electricity from light.

2. The assembly of claim 1, wherein an open porosity of the assembly defined by the open spaces of the frame and the gaps between the plurality of solar cell capsules is about 10% to about 40% for the assembly.

3. The assembly of claim 1, wherein the rigid frame is made of at least one of a polymeric material, a glass, a metal, or combinations thereof.

4. The assembly of claim 1, wherein the rigid frame is made of an epoxy, an epoxy composite, fiberglass composite, a carbon fiber composite, or combinations thereof.

5. The assembly of claim 1, wherein all of the at least one photovoltaic solar cell of all of the plurality of solar cells are electrically connected to each other to establish an electric circuit for generation of electricity from light.

6. The assembly of claim 5, wherein the light comprises sunlight.

7. The assembly of claim 1, wherein the at least one photovoltaic solar cell is a silicon wafer solar cell.

8. The assembly of claim 1, wherein the at least one photovoltaic solar cell is at least one perovskite solar cell.

9. The assembly of claim 1, wherein the at least one photovoltaic solar cell is at least one Copper Indium Gallium Diselenide solar cell.

10. The assembly of claim 1, wherein the at least one photovoltaic solar cell is at least one CdTe solar cell.

11. The assembly of claim 1, wherein the polymeric material encapsulating the at least one photovoltaic solar cell comprises at least one of an epoxy, a silicon rubber covered by epoxy, a silicon rubber sandwiched in an ETFE film, or a silicon rubber sandwiched in an PTFE film.