Claims

1. Cell plate assembly for adjoining an anode side of a membrane electrode assembly of a solid-state compressor, comprising:

- a first cell plate, having a length and a depth, comprising a first channel structure incorporated therein comprising multiple channels extending over at least part of the cell plate, at least with a length more than half of the length of the first cell plate and running parallel to a first surface of the cell plate, with the multiple channels recessed with a depth less than the depth of the first cell plate from a first surface, and running parallel to the first surface of the cell plate, and
- a second cell plate, having a length and a depth, comprising a first surface interfacing the first surface of the first cell plate and having a second channel structure incorporated therein comprising multiple channels recessed with a depth that is less than the depth of the second cell plate, and thus forming a recessed channel partly through the plate from the first surface of the cell plate, extending over at least part of the cell plate and running parallel to the first surface of the cell plate, alongside the interfacing surfaces,

wherein the channels of the respective channel structures are interconnected at the interfacing surfaces of the first and second cell plates and wherein the second cell plate comprises a number of passages connecting the therein incorporated second channel structure with a second surface of the second cell plate opposing the first surface of the second cell plate,
wherein the channels incorporated in the second cell plate enclose an angle with the channels incorporated in the first cell plate.

2. Cell plate assembly according to claim 1, wherein the channels of the second channel structure run substantially perpendicular to the channels of the first channel structure.

3. Cell plate assembly according to claim 1 or claim 2, wherein the channels of the first channel structure have a diameter exceeding that of the channels of the second channel structure.

4. Cell plate assembly according to any one of the preceding claims, wherein the spacing between subsequent channels of the second channel structure is smaller than the spacing between subsequent channels of the first channel structure.

5. Cell plate assembly according to any one of the preceding claims, wherein the first cell plate channel structure is connected to a feed line for feeding a working fluid to the channels of said channel structure.

6. Cell plate assembly according to claim 5, wherein the first cell plate channel structure is connected to at least two separate feed lines, each connecting to different, and preferably opposing ends of the channel structure.

7. Cell plate assembly according to claim 6, wherein the first plate channel structure comprises two separate channel systems, each connected to a different one of the separate feed lines, wherein the channels of the separate channel systems are dead ending.

8. Cell plate assembly according to claim 7, wherein the channels of the separate channel systems enclose one another, thereby forming a interdigitated channel structure wherein subsequent channels are part of different channel systems.

9. Cell plate assembly according to claim 7, wherein the channel structure comprises a single, continuous channel system, the channels of which are at opposing ends thereof connected to separate feed lines.

10. Cell plate assembly according to any one of the preceding claims, wherein the channel structures of the first and second cell plates are formed by elongated recesses provided in the first surface of the second cell plate and the first surface of the first cell plate respectively.

11. First cell plate for use in a cell plate assembly according to any one of the preceding claims.

12. Second cell plate for use in a cell plate assembly according to any one of the claims 1-10.

13. Solid-state compressor for electrochemically compressing a fluid, comprising a membrane electrode assembly enclosed between a~~n~~ cell plate assembly according to any one of the claims 1-10 and a fluid collection plate, wherein an anode side of the membrane electrode assembly faces towards the second surface of the second cell plate of the cell plate assembly and a cathode side of the membrane electrode assembly faces towards the fluid collection plate.

14. Method for operating a solid-state compressor according to claim 13 comprising the steps:

A) feeding a fluid via a feed line to the channels of a first cell plate channel structure,

B) passing the fluid from the channels of a first cell plate channel structure to the channels of a second cell plate channel structure,

C) distributing the fluid from the channels of a second cell plate channel structure via passages over an anode side of a membrane electrode assembly,

D) ionizing the fluid at the anode side of the membrane electrode assembly,

E) passing the ionized fluid through a proton exchange membrane of the membrane electrode assembly, thereby compressing the fluid, and

F) collecting the compressed fluid at a cathode side of the membrane electrode assembly.

15. Method according to claim 14, wherein the method comprises the consecutive step of purging, wherein steps A-F are performed in reverse order, thereby removing impurities from the channel structures on the anode side of the membrane electrode assembly.