

Title (en)
A LITHIUM-ION CELL COMPRISING THREE-DIMENSIONAL CURRENT COLLECTORS AND A METHOD OF MANUFACTURING ELECTRODES FOR THIS CELL

Title (de)
LITHIUM-IONEN-ZELLE MIT DREIDIMENSIONALEN STROMABNEHMERN UND VERFAHREN ZUR HERSTELLUNG VON ELEKTRODEN FÜR DIESE ZELLE

Title (fr)
ÉLÉMENT LITHIUM-ION COMPRENANT DES COLLECTEURS DE COURANT TRIDIMENSIONNELS ET PROCÉDÉ DE FABRICATION D'ÉLECTRODES POUR CET ÉLÉMENT

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Abstract (en)
[origin: WO2021006752A1] A lithium-ion cell having at least one three-dimensional carbon current collector, wherein the three-dimensional carbon current collector of a thickness of 0.1-3.0 mm, preferably 1.0—2.0 mm, is made of porous conductive carbon with pores' size of 10-200 ppi, preferably 40-80 ppi, in form of a shaped element with the required target geometry, dimensions, shape, spatial architecture, relief and porosity, made in a manner not requiring mechanical treatment of the porous carbon material, which collector is filled with an active mass, preferably mixed with a solid or liquid electrolyte. A method of manufacturing electrodes for a lithium-ion cell based on the use of three-dimensional carbon current collectors, wherein the three-dimensional carbon current collector is produced in form of a porous conductive carbon shaped element with the required target the geometry, dimensions, shape, spatial architecture, relief and porosity, in a manner not requiring mechanical treatment of the porous carbon material, where the shaped elements have a porosity of 10-200 ppi, preferably 40-80 ppi, and the shaped elements are filled with an active mass, preferably mixed with a solid or liquid electrolyte. The three-dimensional carbon current collector has a cross-linked type morphology or inverse opal type morphology. The three-dimensional carbon current collector is covered with an elastic conductive coating of a thickness of 1-5 µm, preferably made of a nickel, titanium or aluminium alloy for cathode collectors, or made of copper alloy for anode collectors. After being filled with an active mass, the collectors are optionally compressed in order to compact the active mass, to ensure proper contact between the active mass grains and the current collector, to eliminate voids within the electrode, to obtain the optimum pore size of the collector and give it the target shape and size. The cell according to the invention has light, three-dimensional current collectors made of conductive porous carbon, which have an increased mechanical strength, increased electrical conductivity and increased ability to utilise the active mass, and which can be shaped into any desired target spatial shape. In result, the cell according to the invention has an increased energy capacity and is cheaper in production in comparison to classical solutions, and can also have a shape adapted to the requirements determined by specific applications, and additionally also has a lower environmental impact than conventional cells. The cell according to the invention can be easily implemented into existing technological lines.

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