[0016] These powders are not easy to use industrially since they are difficult to manipulate on account of their poor flowability, they generate substantial losses of pressure and poor distribution of the streams in the beds, especially in dynamic processes involving fluids in flow.

[0017] Thus, the agglomerated forms of these powders are preferred, which are more commonly referred to as zeolite agglomerates and which may be in the form of grains, strands, extrudates or other agglomerates, these said forms possibly being obtained by extrusion, pelletizing, atomization or other agglomeration techniques that are well known to those skilled in the art. These agglomerates do not have the drawbacks inherent in pulverulant materials.

[0018] These agglomerates generally consist of zeolite crystals and of a binder, which is usually inert with respect to the application for which the zeolite is intended, the said binder being intended to ensure the cohesion of the zeolite crystals and to give them the sufficient and necessary mechanical strength for the intended industrial application.

[0019] One object of the embodiments disclosed herein is thus to propose a zeolite material in agglomerated form comprising at least one mesoporous zeolite. As another object, the present disclosure proposes a zeolite material in agglomerated form comprising at least one mesoporous zeolite, and which has improved crystallinity properties when compared with the materials of the prior art.

[0019a] In an aspect, there is provided an agglomerated zeolite material comprising at least one mesoporous zeolite with a number-average diameter of between 0.1 µm and 20 µm with an Si/Al atomic ratio of between 1 and 1.4, limits inclusive, and with a mesopore outer surface area, defined by the t-plot method, of between 40 $m^2.g^{-1}$ and 400 $m^2.g^{-1}$, limits inclusive, the said material having at least the following characteristics:

- a total zeolite content of at least 70% by weight relative to the total weight of the agglomerate,
- a content of mesoporous zeolite(s) of greater than or equal to 30%,
- a binder content, after calcinations performed at 950°C for 1 hour, of less than or equal to 30%,

- a mean volume diameter (D50), or a length (largest dimension when the material is not spherical) of less than or equal to 7 mm, and
- either a bulk crushing strength (BCS) measured according to standard ASTM 7084-04 of between 0.5 MPa and 3 MPa, for a material with a mean volume diameter (D50), or a length (largest dimension when the material is not spherical), of less than 1 mm, limits inclusive,
- or a grain crushing strength, measured according to standards ASTM D 4179 (2011) and ASTM D 6175 (2013), of between 0.5 daN and 30 daN, for a material with a mean volume diameter (D50), or a length (largest dimension when the material is not spherical), of greater than or equal to 1 mm, limits inclusive.

[0020] Yet another object consists in providing a process for preparing a zeolite material in agglomerated form comprising at least one mesoporous zeolite, the said process being readily industrializable, and improved in terms of cost and duration, when compared with the processes for manufacturing agglomerates known in the prior art, while at the same time avoiding degradation of the properties of the mesoporous zeolite(s) present in the said material.

[0020a] In another aspect, there is provided a process for preparing a material as defined above, comprising at least the steps of:

a) agglomeration of crystals of at least one mesoporous zeolite with a number-average diameter of between 0.1 µm and 20 µm, preferably between 0.1 µm and 10 µm, more preferably between 0.5 µm and 10 µm and even more preferentially between 0.5 µm and 5 µm, with an Si/Al atomic ratio of between 1 and 1.4, limits inclusive, and with a mesopore outer surface area, defined by the t-plot method, of between 40 $m^2.g^{-1}$ and 400 $m^2.g^{-1}$ and preferably between 60 $m^2.g^{-1}$ and 200 $m^2.g^{-1}$, limits inclusive, with a binder comprising at least 80% clay or a mixture of clays, which are optionally zeolitizable, and with up to 5% of additives, and also with the amount of water that allows the shaping of the agglomerated material;

b) drying of the agglomerates at a temperature of between 50°C and 150°C;

c) calcination of the agglomerates of step b) with flushing with an oxidizing and/or inert gas, especially with gases such as oxygen, nitrogen, air, a dry and/or decarbonated air, an oxygen-depleted air, which is optionally dried and/or decarbonated, at a

temperature above 150°C, typically between 180°C and 800°C and preferentially between 200°C and 650°C, for a few hours, for example from 2 to 6 hours;

d) optionally zeolitization of the binder by placing the agglomerates obtained in step c) in contact with an alkaline basic solution;

e) optionally cation exchange(s) of the agglomerates of step c) or of step d) by placing in contact with a solution of at least one alkali metal or alkaline-earth metal salt;

f) and then washing and drying of the agglomerates obtained in steps d) or e) under the conditions described in step b), and

g) production of the agglomerated zeolite material by activation of the agglomerates obtained in step f) under the conditions described in step c).

[0021] More particularly, one of the objects of the embodiments disclosed herein consists in proposing an agglomerated zeolite material having the purity, crystallinity and pore distribution properties of the starting mesoporous zeolite(s) and moreover having good mechanical strength and optimized crystallinity, and thus enabling easy and efficient industrial use, for example in the fields of catalysis (catalysts or catalyst supports), or in dynamic or static separation, adsorption or ion exchange processes.

[0022] Yet other objects will emerge in the light of the description of the present disclosure that follows.

[0023] The Applicant has discovered that it is possible to totally or at least partially overcome the drawbacks mentioned in the prior art and to manufacture in an economical

CLAIMS

1. Agglomerated zeolite material comprising at least one mesoporous zeolite with a number-average diameter of between 0.1 µm and 20 µm with an Si/Al atomic ratio of between 1 and 1.4, limits inclusive, and with a mesopore outer surface area, defined by the t-plot method, of between 40 $m^2.g^{-1}$ and 400 $m^2.g^{-1}$, limits inclusive, the said material having at least the following characteristics:

- a total zeolite content of at least 70% by weight relative to the total weight of the agglomerate,
- a content of mesoporous zeolite(s) of greater than or equal to 30%,
- a binder content, after calcinations performed at 950°C for 1 hour, of less than or equal to 30%,
- a mean volume diameter (D50), or a length (largest dimension when the material is not spherical) of less than or equal to 7 mm, and
- either a bulk crushing strength (BCS) measured according to standard ASTM 7084-04 of between 0.5 MPa and 3 MPa, for a material with a mean volume diameter (D50), or a length (largest dimension when the material is not spherical), of less than 1 mm, limits inclusive,
- or a grain crushing strength, measured according to standards ASTM D 4179 (2011) and ASTM D 6175 (2013), of between 0.5 daN and 30 daN, for a material with a mean volume diameter (D50), or a length (largest dimension when the material is not spherical), of greater than or equal to 1 mm, limits inclusive.

2. Material according to Claim 1, also having an apparent mass per unit volume of between 0.4 $g.cm^{-3}$ and 1 $g.cm^{-3}$, limits inclusive.

3. Material according to Claim 1 or Claim 2, in which said mesoporous zeolite is chosen from mesoporous zeolites of LTA, EMT and FAU structure with an Si/Al atomic ratio of between 1 and 1.4, limits inclusive.