- a porosity $\varepsilon_p = \frac{Vma + Vme}{Vg}$, determined by mercury intrusion porosimetry, in which $V_{ma}$ denotes the macropore volume, $V_{me}$ denotes the mesopore volume and Vg denotes the grain volume, of between 25% and 35%, the volumes being expressed in $cm^3.g^{-1}$.

**[0017b]** In another aspect of the present disclosure, there is provided a process for preparing a zeolite-based adsorbent as disclosed herein, comprising at least the following steps:

a) a step of mixing crystals of at least one zeolite with an agglomeration binder containing at least 80% of zeolitizable clay, preferably at least 90% of zeolitizable clay and more preferably at least 95% of zeolitizable clay by weight, and optionally a source of silica, followed by forming and a firing step at a temperature of between 500 and 700°C,

b1) a first step of zeolitization by placing the material obtained in step a) in contact with an alkaline basic solution, with a concentration of between 0.2 M and 0.9 M, limits inclusive,

b2) a second step of zeolitization by placing the material obtained in step b1) in contact with an alkaline basic solution, with a concentration of between 1.2 M and 4.0 M, limits inclusive,

b1 and b2 possibly being performed in any order and b1 and/or b2 possibly being repeated,

c) an optional step of cationic exchange of the cations contained in the reaction medium obtained from the zeolitization steps by placing in contact with a solution of barium ions or of barium ions and potassium ions,

d) a step of washing and drying the material thus obtained, and

e) a step of activation of the material obtained in step d), by heating to a temperature of between 100°C and 400°C, and recovery of the zeolite-based adsorbent in the form of agglomerates.

**[0017c]** In a further aspect of the present disclosure, there is provided a process for separating *para*-xylene from aromatic hydrocarbon isomer fractions containing 8 carbon atoms, in the liquid phase, by absorption of *para*-xylene using an adsorbent as disclosed herein or likely to be prepared by a process as disclosed herein, in the presence of a desorbent.

**[0017d]** In another aspect of the present disclosure, there is provided a process for separating *para*-xylene from aromatic hydrocarbon isomer fractions containing 8 carbon atoms, in the gaseous phase, by absorption of *para*-xylene using an adsorbent as disclosed herein or likely to be prepared by a process as disclosed herein, in the presence of a desorbent.

**[0018]** The present disclosure relates to a zeolite-based adsorbent in the form of agglomerates, said adsorbent having:

- a tortuosity factor $\tau$, calculated from the pore distribution determined by mercury intrusion porosimetry, strictly greater than 1 and strictly less than 3;

- a porosity $\varepsilon_p = \frac{Vma + Vme}{Vg}$, determined by mercury intrusion porosimetry, in which $V_{ma}$ denotes the macropore volume, $V_{me}$ denotes the

## CLAIMS

1. A zeolite-based adsorbent in the form of agglomerates, said adsorbent having:

- a tortuosity factor $\tau$, calculated from the pore distribution determined by mercury intrusion porosimetry, strictly greater than 1 and strictly less than 3;

- a porosity $\varepsilon_p = \frac{Vma + Vme}{Vg}$, determined by mercury intrusion porosimetry, in which $V_{ma}$ denotes the macropore volume, $V_{me}$ denotes the mesopore volume and Vg denotes the grain volume, of between 25% and 35%, the volumes being expressed in $cm^3.g^{-1}$.

2. The zeolite-based adsorbent according to claim 1, in which the tortuosity factor $\tau$ is between 1.5 and 2.7.

3. The zeolite-based adsorbent according to any one of claim 1 or 2, wherein the high mechanical bulk crushing strength (BCS), measured via the Shell method series SMS1471-74 adapted for agglomerates less than 1.6 mm in size, is greater than or equal to 1.0 MPa, the size corresponding to the number-mean diameter of the agglomerate, or its number-mean largest dimension when it is not spherical.

4. The zeolite-based adsorbent according to any one of claims 1 to 3, wherein said adsorbent has a size of between 0.1 mm and 1 mm, limits inclusive, the size corresponding to the number-mean diameter of the agglomerate, or its number-mean largest dimension when it is not spherical.

5. The zeolite-based adsorbent according to any one of claims 1 to 4, wherein, said adsorbent comprises a zeolite chosen from the zeolites of FAU structure.

6. The zeolite-based adsorbent according to claim 5, said zeolite being zeolite X, alone or as a mixture with other zeolites.

7. The zeolite-based adsorbent according to any one of claims 1 to 6, said adsorbent comprising more than 90% by weight of zeolite(s).

8. The zeolite-based adsorbent according to any one of claims 1 to 7, wherein said zeolite(s) are in the form of crystals between 10 nm and 1500 nm in size, the size corresponding to the number-mean diameter of the agglomerate, or its number-mean largest dimension when it is not spherical.

9. The zeolite-based adsorbent according to any one of claims 1 to 8, wherein the pore distribution satisfies the inequalities a) and/or b) below:

a) $$\frac{Vme}{Vme + Vma} \leq 0.1,$$

b) $$0.4 \leq \frac{Vmi}{Vma + Vme + Vmi}.$$

Vmi denoting the micropore volume expressed in $cm^3.g^{-1}$, determined by nitrogen adsorption.

10. The zeolite-based adsorbent according to any one of claims 1 to 9, further comprising barium and/or potassium.

11. A process for preparing a zeolite-based adsorbent according to any one of claims 1 to 10, comprising at least the following steps:

a) a step of mixing crystals of at least one zeolite with an agglomeration binder containing at least 80% of zeolitizable clay, preferably at least 90% of zeolitizable clay, and more preferably at least 95% of zeolitizable clay by weight, and optionally a source of silica, followed by forming and a firing step at a temperature of between 500 and 700°C,

b1) a first step of zeolitization by placing the material obtained in step a) in contact with an alkaline basic solution, with a concentration of between 0.2 M and 0.9 M, limits inclusive,

b2) a second step of zeolitization by placing the material obtained in step b1) in contact with an alkaline basic solution, with a concentration of between 1.2 M and 4.0 M, limits inclusive,

b1 and b2 possibly being performed in any order and b1 and/or b2 possibly being repeated,

c) an optional step of cationic exchange of the cations contained in the reaction medium obtained from the zeolitization steps by placing in contact with a solution of barium ions or of barium ions and potassium ions,

d) a step of washing and drying the material thus obtained, and

e) a step of activation of the material obtained in step d), by heating to a temperature of between 100°C and 400°C, and recovery of the zeolite-based adsorbent in the form of agglomerates.

12. The preparation process according to claim 11, comprising one or more additional forming steps performed after any one of steps a), b1)/b2), c), d) or e).

13. A process for separating para-xylene from aromatic hydrocarbon isomer fractions containing 8 carbon atoms, in the liquid phase, by absorption of para-xylene using an adsorbent according to any one of claims 1 to 10 or likely to be prepared according to any one of claims 11 to 12, in the presence of a desorbent.

14. A process for separating *para*-xylene from aromatic hydrocarbon isomer fractions containing 8 carbon atoms, in the gaseous phase, by absorption of *para*-xylene using an adsorbent according to any one of claims 1 to 10 or likely to be prepared according to any one of claims 11 to 12, in the presence of a desorbent.

15. The process according to any one of claims 13 to 14, of simulated moving bed type.