separation of the *para*-xylene present in aromatic $C_8$ fractions in a liquid-phase process, for example of simulated countercurrent type.

**[0024]** The prior art teaches that the zeolitization of agglomerated adsorbents makes it possible to increase the adsorption capacity. From the prior art, a person skilled in the art understands that he can carry out a complete conversion of the binder to zeolite in order to obtain a maximum adsorption capacity without *a priori* affecting the mechanical properties of the said agglomerated adsorbents.

**[0025]** In point of fact, the inventors have now discovered that, after complete conversion of the binder to zeolite, the mechanical properties are not always retained or optimized. A need consequently remains for agglomerated zeolitic adsorbents exhibiting good mechanical properties and good selectivity properties, in particular from the viewpoint of the separation of xylene isomers from aromatic $C_8$ fractions. The inventors have thus discovered that there exists a compromise between adsorption optimum and mechanical strength optimum.

**[0026]** It is thus an objective of the present invention to provide agglomerated zeolitic adsorbents, based on zeolite X, having small crystals, comprising barium or barium and potassium, the said adsorbents combining:

- a good selectivity,
- an improved material transfer,
- an optimum adsorption capacity and
- a good mechanical strength,

for the separation of the *para*-xylene present in aromatic $C_8$ fractions in a liquid-phase process, for example of simulated countercurrent type.

**[0027]** The inventors have found that the zeolitic adsorbents, based on zeolite X, having small crystals, agglomerated with a zeolitisable binder, the binder of which has been subjected to a complete or virtually complete zeolitization reaction, so as to respectively completely or virtually completely convert the binder into active material, do not exhibit a maximum adsorption capacity or a good mechanical strength.

**[0028]** The inventors have discovered that the best compromise between maximum adsorption capacity and high mechanical strength takes place not for a maximum degree of zeolitization but for a degree of zeolitization such that the content of non-zeolitic phase of the adsorbent is between 2% and 5% by weight, with respect to the total weight of the said adsorbent.

SUMMARY

[0028a] In one aspect of the present disclosure, there is provided an agglomerated zeolitic adsorbent, based on crystals of zeolite X and on at least one non-zeolitic phase, in which adsorbent:

- the crystals of zeolite X exhibit:
  i. a number-average diameter of less than or equal to 1.7 µm, preferably of less than or equal to 1.5 µm and more preferably of less than or equal to 1.2 µm,
  ii. an Si/Al atomic ratio of between 1.00 and 1.50, preferably between 1.05 and 1.50 and more preferably between 1.10 and 1.50, limits included,
- the content by weight of non-zeolitic phase (NZP) is such that 2.0% < NZP < 5.0%, preferably such that 3.0% < NZP < 5.0%, more preferably such that 3.0% < NZP < 4.0%, advantageously such that 3.2% < NZP < 3.7%, by weight of the total weight of the adsorbent,
- the content by weight of barium oxide (BaO) is greater than 23%, preferably greater than 32% and more preferably greater than 33% by weight, with respect to the total weight of the adsorbent,
- the content by weight of potassium oxide $K_2O$ is less than 9%, preferably less than 8% and more preferably between 0% and 2% and advantageously between 0% and 1%, limits included, with respect to the total weight of the adsorbent, and
- the total content by weight of oxides of alkali metal or alkaline earth metal ions, other than BaO and $K_2O$, is less than 5% and preferably between 0% and 2% and advantageously between 0% and 1%, limits included, with respect to the total weight of the adsorbent.

[**0028b**] In another aspect of the present disclosure, there is provided a process for the preparation of an adsorbent as defined herein, comprising at least the stages of:

a) agglomeration of crystals of zeolite X with a number-average diameter of less than or equal to 1.7 µm, preferably of less than or equal to 1.5 µm and more preferably of less than or equal to 1.2 µm, with an Si/Al atomic ratio of between 1.00 and 1.50, preferably between 1.05 and 1.50 and more preferably still of between 1.10 and 1.50, limits included, with a binder comprising at least 80% by weight, preferably at least 90% by weight, and more preferably at least 95% by weight of zeolitisable clay and with a source of silica, then shaping of agglomerates and, finally, drying and calcination of said agglomerates,

b) zeolitization of the said zeolitisable binder by bringing the agglomerates obtained in stage a) into contact with a basic alkaline solution,

c) cationic exchange of the agglomerates of stage b) by bringing into contact with a solution of barium ions or of barium ions and potassium ions,

d) optional cationic exchange by bringing the agglomerates of stage c) into contact with a solution of potassium ions,

e) then washing and drying the agglomerates thus obtained, and

f) production of the zeolitic adsorbent by activation of the agglomerates obtained in stage e).

[0028c] In a further aspect of the present disclosure, there is provided an adsorbent as defined herein, capable of being obtained according to a process as defined herein.

[0028d] In yet another aspect of the present disclosure, there is provided a use of an adsorbent as defined herein in the processes of:

- separation of fractions of aromatic C8 isomers and in particular xylenes,
- separation of substituted toluene isomers, such as nitrotoluene, diethyltoluene, toluenediamine and others,
- separation of cresols,
- separation of polyhydric alcohols.

[0028e] In a further aspect of the present disclosure, there is provided a process for the recovery of para-xylene from fractions of aromatic hydrocarbon isomers comprising 8 carbon atoms, in the liquid phase, by adsorption of the para-xylene by means of an adsorbent as defined, in the presence of a desorbent.

[0028f] In another aspect of the present disclosure, there is provided a process for the recovery of para-xylene from fractions of aromatic hydrocarbon isomers comprising 8 carbon atoms, in the gas phase, by adsorption of the para-xylene by means of an adsorbent as defined herein herein, in the presence of a desorbent.

[0028g] In a further aspect of the present disclosure, there is provided a process for the separation of polyhydric alcohols employing an adsorbent as defined herein.

[0028h] In another aspect of the present disclosure, there is provided a process for the separation of substituted toluene isomers, such as nitrotoluene, diethyltoluene or toluenediamine, employing an adsorbent as defined herein.

[0028i] In a further aspect of the present disclosure, there is provided a process for the separation of cresols employing an adsorbent as defined herein.

## ACCOUNT OF THE INVENTION

**[0029]** A first subject-matter of the present invention is thus an agglomerated zeolitic adsorbent, having optimized properties, in particular for the separation of *para*-xylene from aromatic $C_8$ fractions. The agglomerated zeolitic adsorbent exhibits maximum