materials. Each channel contains adsorbent particles which are not immobilized in the article and attrition between the said adsorbent particles are readily to occur.

**[0006]** There is therefore still a need for adsorbing articles (or else adsorbent articles) with high volumetric efficiency, with adsorption and desorption kinetics that are compatible, especially for uses where high adsorption kinetics are required, for example for gas and/or liquid dynamic separation, such as Pressure Swing Adsorption (PSA), Temperature Swing Adsorption (TSA), and the like.

**[0007]** Still a need exists for immobilized zeolitic particles in adsorbent beds to prevent any move of said particles, thus avoiding attrition and dust formation, while keeping a high separation efficiency (high volumetric capacity and high kinetics).

**[0008]** Again, there is a need for adsorbent articles (or blocks) with high zeolite content, low attrition behavior of the particles together, limited pressure drop and high diffusion kinetics.

**[0009]** The Applicant has now discovered that the above needs can be met in whole or at least in part with the adsorbent article of the present invention, which is now explained.

**[0009a]** In an aspect, there is provided an adsorbent article comprising zeolitic particles of at least one zeolitic adsorbent, said particles being immobilized with at least one resin, wherein the average particle size of the at least one zeolitic adsorbent ranges from 0.03 mm to 3 mm, preferably from 0.04 mm to 2 mm, more preferably from 0.05 mm to 1 mm, and wherein the zeolite content is equal to or greater than 60 wt%, more preferred when zeolite content is greater than 70 wt%, preferably strictly greater than 80 wt%, more preferably strictly greater than 85 wt%, still more preferably strictly greater than 88 wt%, typically equal to or greater than 90 wt%, relative to the total weight of the said article, wherein the zeolitic particles in the article comprise at least one zeolitic adsorbent in the form of zeolite(s) agglomerated with one or more inorganic binder.

**[0009b]** In another aspect, there is provided a method for separating a fluid from one or more other fluid(s) and/or separating a fluid from impurities contained in said fluid, comprising the step of contacting said fluid with at least one article as defined above.

**[0009c]** In another aspect, there is provided a blend of zeolitic particles with at least one resin, preferably in the form of particles, preferably beads, agglomerates and aggregates of beads with preferred volumetric average particle size of less than 100 µm, 50 µm preferably less than 20 µm, more preferably less than 12 µm, and more preferably less than 10 µm.

## CLAIMS

**1.** An adsorbent article comprising zeolitic particles of at least one zeolitic adsorbent, said particles being immobilized with at least one resin, wherein the average particle size of the at least one zeolitic adsorbent ranges from 0.03 mm to 3 mm, preferably from 0.04 mm to 2 mm, more preferably from 0.05 mm to 1 mm, and wherein the zeolite content is equal to or greater than 60 wt%, more preferred when zeolite content is greater than 70 wt%, preferably strictly greater than 80 wt%, more preferably strictly greater than 85 wt%, still more preferably strictly greater than 88 wt%, typically equal to or greater than 90 wt%, relative to the total weight of the said article, wherein the zeolitic particles in the article comprise at least one zeolitic adsorbent in the form of zeolite(s) agglomerated with one or more inorganic binder.

**2.** The article of claim 1, wherein the zeolitic particles in the article comprise at least one zeolitic adsorbent in the form of zeolite(s) agglomerated with one or more inorganic binder chosen from natural clays, synthetic clays, silica, and alumina, preferably natural clays and/or synthetic clays, more preferably natural clays.

**3.** The article as claimed in any of claims 1 or 2, wherein the zeolitic particles have various forms and shapes, for example beads, pellets, extrudates, crushed beads, crushed pellets, flakes, cracks, and in general all types of shapes, rounded or not, hollowed or not, such as cenospheres, and/or mixtures thereof.

**4.** The article as claimed in any of claims 1 to 3, wherein at least one zeolitic particle in said article has a dimension equal to or greater than 0.1 mm.

**5.** The article as claimed in any of claims 1 to 4, wherein said zeolite particles comprise at least one zeolite or a mixture of zeolites, that is(are) advantageously chosen from among the A zeolites (framework type LTA), chabazite (framework type CHA), clinoptilolite (framework type HEU), EMT (framework type EMT), ZSM-5 (framework type MFI), Silicalite-1 (framework type MFI) and faujasite (framework type FAU), and more preferably from among FAU type zeolites.

**6.** The article as claimed in claim 5, wherein the FAU type zeolites are chosen from among zeolites X, zeolites MSX, zeolites LSX and zeolites Y, as well as mixtures of two of more thereof in all proportions.

**7.** The article as claimed in any of claims 1 to 6, wherein the zeolitic particles contain an inorganic binder, said inorganic binder being chosen from kaolins, kaolinites, nacrites, dickites, halloysites, attapulgites, sepiolites, delaminated clays (for example as gels), montmorillonites, bentonites, illites and metakaolins, as well as mixtures of two or more of them in any proportions.

**8.** The article as claimed in any of claims 1 to 7, wherein the at least one resin includes polymers, particularly thermoplastic homo- and/or copolymers and also polycondensates

**9.** The article as claimed in any of claims 1 to 8, wherein the at least one resin includes polymers, chosen from among polyolefins, polypropylene, ethylene copolymers, copolymers of ethylene-vinyl acetate, polyacrylics, acrylonitrile homo- and/or co-polymers, polyacrylates, polymethacrylates, acrylate copolymers and/or methacrylate copolymers, polystyrenes and/or styrene copolymers, homo- and co-polyesters, halogenated polymers and copolymers, other fluorinated homopolymers and copolymers, homo- and co-polyamides, aromatic polyamides, polyvinylchlorides, polyurethanes, polyether sulfones, polyether ketones, polycarbonates, epoxy resins, phenolic resins, thermosetting resins and elastomeric resins, as well as mixtures thereof.

**10.** The article as claimed in any of claims 1 to 9, the content in active material (i.e. adsorbent material) of which, expressed as the weight zeolite content

relative to the total weight of the said article, is equal to or greater than 60 wt%, preferably greater than 70 wt%, more preferably strictly greater than 80 wt%, still more preferably strictly greater than 85 wt%, even more preferably strictly greater than 88 wt%, typically equal to or greater than 90 wt%.

**11.** The article as claimed in any of claims 1 to 10, the shape of which being chosen from among cubes, parallelepipeds, spheres, sheets, pleated sheets, films, pleated films, cylinders, convex regular polyhedrons, prisms, cones, ellipses, pyramids, wave shaped pattern, and helical.

**12.** The article as claimed in any of claims 1 to 11, which includes a variety of features used to increase surface area, e.g. protrusions (such as cones, cylinders, concentric circles, fins, fins with supports), bores (tapered and non-tapered bores, partial and through bores, may include cross sectional shapes such as circles, polygons, stars).

**13.** The article as claimed in any of claims 1 to 12, which includes a variety of channels, which may be circular, polyhedral or sinusoidal in nature.

**14.** The article as claimed in any of claims 1 to 13, having a mechanical resistance, expressed as compressive strength, ranging from 290 psi (2 MPa) to 14500 psi (100 MPa).

**15.** A method for separating a fluid from one or more other fluid(s) and/or separating a fluid from impurities contained in said fluid, comprising the step of contacting said fluid with at least one article as claimed in any of claims 1 to 14.

**16.** The method of claim 17, for drying, conditioning, purifying and separating gases, liquids and vapors.

**17.** A blend of zeolitic particles with at least one resin, preferably in the form of particles, preferably beads, agglomerates and aggregates of beads with preferred volumetric average particle size of less than 100 µm, 50 µm preferably less than 20 µm, more preferably less than 12 µm, and more preferably less than 10 µm.

**18.** The blend as claimed in claim 17, wherein the particle size ratio [(resin particle size) to (zeolitic particle size)] preferably ranges from 1:20000 to 3:1, preferably from 1:10000 to 2.5:1, more preferably from 1:1000 to 2:1.

19. The blend as claimed in claim 17 or 18, wherein the zeolite particles comprise at least one zeolite or a mixture of zeolites chosen from among FAU type zeolites