In particular embodiments, the present invention relates to the treatment of a coal fly ash generated in a coal-fired power plant in which a dry sorbent is injected into a flue gas generated by combustion of coal in order to remove at least a portion of pollutants contained in the flue gas. The sorbent used for pollutants removal from the flue gas preferably comprises a sodium-containing sorbent, whereby the fly ash is a sodic fly ash which contains at least one sodium compound.

A particular aspect of the present invention relates to a method for reducing the leachability of selenium contained in a sodic fly ash, wherein the sodic fly ash is provided by a combustion process in which a sorbent comprising a sodium-containing sorbent is in contact with a flue gas generated during combustion to remove at least a portion of pollutants contained in the flue gas, such method comprising: (a) contacting said sodic fly ash with at least one additive in the presence of water, wherein the at least one additive comprises at least one strontium-containing compound; at least one barium-containing compound; dolomite; one or more dolomite derivatives (like dolomitic lime, selectively calcined dolomite, and/or hydrated dolomite); or any combinations of two or more thereof; and (b) drying the material resulting from step (a) to form a dried matter, wherein drying is carried out at a temperature more than 100°C and equal to or less than 150°C without calcining or sintering the material resulting from step (a).

The sodic fly ash is preferably a sodic coal fly ash provided by a coal combustion process in which a dry sorbent comprising a sodium-containing sorbent is injected into the flue gas generated by coal combustion to remove at least a portion of pollutants (preferably acid gases, such as SOx, HCl, HF) contained in the flue gas.

In such method, the additive preferably comprises at least one strontium-containing compound, dolomite, a dolomite derivative (such as dolomitic lime, hydrated dolomite), sodium silicate, or any combinations of two or more thereof.

The contacting may comprise mixing the sodic fly ash and an aqueous solution or slurry or suspension comprising the at least one additive with optionally additional water or an acidic solution; may comprise mixing water or an acidic solution with a dry blend comprising the at least one additive in solid form and the sodic fly ash; and/or may comprise spraying an aqueous solution or slurry or suspension containing the at least one additive onto said sodic fly ash with optionally additional water or an acidic solution.

CLAIMS

1. A method for reducing the leachability of selenium contained in a sodic fly ash, wherein the sodic fly ash is provided by a combustion process in which a sorbent comprising a sodium-containing sorbent is injected into a flue gas generated during combustion to remove at least a portion of pollutants contained in the flue gas,

said method comprising:

(a) contacting said sodic fly ash with at least one additive in the presence of water, wherein the at least one additive comprises at least one strontium-containing compound; at least one barium-containing compound; dolomite; one or more dolomite derivatives, like dolomitic lime, selectively calcined dolomite, and/or hydrated dolomite; or any combinations of two or more thereof; and

(b) drying the material resulting from step (a) to form a dried matter, wherein drying is carried out at a temperature more than 100°C and equal to or less than 150°C without calcining or sintering the material resulting from step (a).

2. The method according to the preceding claim, wherein said at least one additive comprises strontium hydroxide, strontium chloride, sodium silicate, dolomite, dolomitic lime, or any combinations of two or more thereof.

3. The method according to any of the preceding claims, wherein said sodic fly ash has a Na content greater than 1.5 wt% expressed as Na_2O, preferably greater than 2 wt% and/or has a Na content of less than 50 wt% expressed as Na_2O, preferably less than 45 wt%.

4. The method according to any of the preceding claims, further comprising first dispersing or dissolving the at least one additive into water or an acidic solution to form an aqueous suspension, slurry or solution containing the at least one additive before contacting said sodic fly ash with said resulting aqueous dispersion, slurry, or solution.

5. The method according to any of the preceding claims, wherein contacting comprises mixing said sodic fly ash and an aqueous solution or slurry or suspension containing the at least one additive with optionally additional water or an acidic solution.

6. The method according to any of the preceding claims, wherein contacting comprises spraying an aqueous solution or slurry or suspension containing the at least one additive onto said sodic fly ash with optionally additional water or an acidic solution.

7. The method according to any ones of Claims 1 to 3, further comprising first dry mixing the at least one additive in solid form and said sodic fly ash to form a dry blend, and wherein the contacting step comprising mixing water or an aqueous medium, such as an acidic solution, with said dry blend.

8. The method according to any of the preceding claims, wherein contacting in step (a) uses a water content so as to form a paste comprising the at least one additive and said sodic fly ash.

9. The method according to Claim 8, wherein the paste contains at most 40 wt% water, preferably contains between 20 wt% and 35 wt% water.

10. The method according to any of the preceding claims, wherein contacting is carried out under an acidic pH of from 3 to 7 or under near-neutral pH of from 6 to 8.

11. The method according to any of the preceding claims, wherein the sodic fly ash is characterized by a liquid holding capacity, and wherein the amount of water used during contacting in step (a) is within +/- 5 wt% of said liquid holding capacity of the sodic fly ash.

12. The method according to any of the preceding claims, wherein contacting in step (a) takes place for a time period of no less than 10 minutes and/or of no more than 12 hours.

13. The method according to any of the preceding claims, wherein contacting in step (a) takes place at a temperature of less than 50°C.

14. The method according to claim 1 comprising successive contacting steps (a_n) with optionally one or more drying or partial drying steps (b') carried out between contacting steps (a_n), and a final drying step (b); and wherein the additive(s) used in the contacting steps (a_n) are the same additive applied in several portions or are different additives; and wherein the successive contacting steps (a_n) employ the same contacting technique or different contacting techniques used in successive contacting steps (a_n)..

15. The method according to claim 1 or 14, claim 1 or 14, wherein two or more additives are contacted with the sodic fly ash in separate contacting steps (a_n), the method comprising:

(a1) contacting the sodic fly ash with a first additive in the presence of water, wherein the at least one additive comprises at least one strontium-containing compound; at least one barium-containing compound; dolomite; one or more dolomite derivatives, like dolomitic lime, selectively calcined dolomite, and/or hydrated dolomite; or any combinations of two or more thereof; and

(b') optionally drying the contacted material resulting from step (a1) to form a first partially-dried or dried matter;

(a2) contacting the contacted sodic fly ash resulting from step (a1) or the partially-dried / dried matter formed in optional step (b') with a second additive optionally in the presence of additional water; wherein the second additive comprises at least one strontium-containing compound; at least one barium-containing compound; dolomite; one or more dolomite derivatives, like dolomitic lime, selectively calcined dolomite, and/or hydrated dolomite; at least one silicate-containing compound; or any combinations of two or more thereof;

(b) drying the material resulting from step (a2) to form a final dried matter.

16. The method according to any of the preceding claims, wherein the sodium-containing sorbent is selected from the group consisting of sodium carbonate (Na_2CO_3), sodium bicarbonate ($NaHCO_3$), sodium sesquicarbonate ($Na_2CO_3.NaHCO_3.2H_2O$), sodium sulfite (Na_2SO_3), and any combinations of two or more thereof.

17. The method according to any of the preceding claims, wherein the sodic fly ash before contacting and drying contains at least one sodium compound selected from the group consisting of sodium carbonate, sodium sulfate, sodium sulfite, sodium chloride, sodium fluoride, one or more sodium compounds containing selenium, and any combinations of two or more thereof.

18. The method according to any of the preceding claims, wherein the dried matter obtained in step (b) contains at least 50% less leachable selenium than the sodic fly ash before contacting in step (a).

19. The method according to any of the preceding claims, wherein the dried matter resulting from step (b) has 1 ppm or less of leachable Se.

20. The method according to any one of claims 1 to 14 or claims 16 to 19, wherein said at least one additive comprises strontium hydroxide, strontium chloride, sodium silicate, dolomitic lime, or a combination of sodium silicate with at least one compound selected from the group consisting of strontium hydroxide, strontium chloride, and dolomitic lime.