CLAIMS

1. A perovskite structure comprising a composition comprising a first organic cation, a second cation, a metal cation and a counter anion, wherein the perovskite structure comprises layers stacked in a stacking direction and polarized charge domains arranged along a horizontal direction which is perpendicular to the layers stacking direction, wherein the first organic cation comprises a linear or branched C_2-C_{10} alkyl substituted with an aryl moiety.

2. The perovskite structure of claim 1, wherein the first organic cation comprises an ammonium functional group, wherein the second cation is a monovalent cation, wherein the metal cation is a divalent metal cation and wherein the counter anion is a monovalent anion.

3. The perovskite structure of claim 2, wherein the composition is of the general formula $((RNH_4)^+_2(A^+)_{\bar{n}-1}M^{2+}_{\bar{n}}X^-_{3\bar{n}+1})$, wherein:
R is a linear or branched C_2-C_{10} alkyl substituted with an aryl moiety;
A^+ is the monovalent cation;
$\bar{n}$ is an integer selected from 2 to ∞;
M^{2+} is the divalent metal cation; and
X^- is the monovalent anion.

4. The perovskite structure of claim 3, comprising octahedral sheets of $[MX_6]^{4-}$ formed from M^{2+} and X^-, wherein the octahedral sheets are perpendicular to the layers of the perovskite structure.

5. The perovskite structure of claim 4, wherein $\bar{n}$ signifies a number of consecutive layers in the octahedral sheets.

6. The perovskite structure of claim 4 or 5, wherein one of the octahedral sheets has a smallest width of at least about 5 Å.

7. The perovskite structure of any of claims 1 to 6, being non-centrosymmetric.

8. The perovskite structure of any of claims 1 to 7, wherein the second cation comprises an ammonium ion.

9. The perovskite structure of any of claims 1 to 7, wherein the second cation is any one selected from a group consisting of a methylammonium ion, a formamidinium ion, a hydroxylammonium ion, a hydrazinium ion, an azetidinium ion, an imidazolium ion, a dimethylammonium ion, an ethylammonium ion, a phenethylammonium ion, a guanidinium ion, a tetramethylammonium ion, a thiazolium ion, a 3-pyrrolinium ion, a tropylium ion, a piperazinium ion, and a dabconium ion.

10. The perovskite structure of any of claims 1 to 9, wherein the second cation is a methylammonium ion.

11. The perovskite structure of any of claims 1 to 10, wherein the first organic cation comprises a phenylethyl moiety.

12. The perovskite structure of any of claims 1 to 11, wherein the counter anion is a halide.

13. The perovskite structure of claim 12, wherein the halide is an iodide, a bromide, a chloride or a mixture thereof.

14. The perovskite structure of claim 12, wherein the halide is an iodide.

15. The perovskite structure of any of claims 1 to 14, wherein the metal cation is any metal of group 11, group 14 or group 15 or a mixture of these.

16. The perovskite structure of any of claims 1 to 14, wherein the metal cation is a heavy metal cation or a mixture of several heavy metal cations.

17. The perovskite structure of claim 16, wherein the heavy metal cation is lead.

18. A process for the production of a perovskite structure comprising polarizable charge domains, the process comprising:

a) forming a perovskite structure from a first organic cation, a second cation, a metal cation and a counter anion on a substrate, wherein the first organic cation comprises a linear or branched C_2-C_{10} alkyl substituted with an aryl moiety; and
b) applying an external electric field through at least one polarizable charge domain of the polarizable charge domains to modify a polarization of the at least one polarizable charge domain.

19. The process of claim 18, wherein step a) further comprises preparing a precursor solution from the first organic cation, the second cation, the metal cation and the counter anion.

20. The process of claim 19, wherein step a) further comprises heating the precursor solution to a temperature above room temperature, and depositing the precursor solution on the substrate.

21. The process of any of claims 18 to 20, wherein the external electric field through the at least one polarizable charge domain of the polarizable charge domains is chosen from about 0.1 kV/cm to about 100 kV/cm.

22. Use of a perovskite structure comprising a composition comprising a first organic cation, a second cation, a metal cation and a counter anion, wherein the first organic cation comprises a linear or branched C_2-C_{10} alkyl substituted with an aryl moiety, wherein the perovskite structure comprises layers stacked in a stacking direction and wherein the perovskite structure has polarizable charge domains arranged in a horizontal direction which is perpendicular to the layers stacking direction, as a memory device structure,
wherein a polarization of a domain of the polarizable charge domains represents a unit of information.