Aluminium silicate (Kaolin)

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Document N5

Consideration of isomeric composition in the risk assessment

Registration Dossier according to Regulation 1107/2009
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[1] It is suggested that applicants adopt a similar approach to showing revisions and version history as outlined in SANCO/10180/2013 Chapter 4 How to revise an Assessment Report

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1 CONSIDERATION OF ISOMERIC COMPOSITION IN THE RISK ASSESSMENT

Not applicable.

Structural isomerism:

Kaolin is a natural, inorganic silicate mineral**.** Silicate minerals have been extensively studied in geology and are classified based on the structure of their silicate groups, which contain different ratios of silicon and oxygen.

Kaolin belongs to the class of phyllosilicates. Phyllosilicates are characterised by a bi-dimensional lattice formed by parallel sheets of silicate tetrahedra of composition Si_2O_5 (i.e. a 2:5 ratio between silica and oxygen) covalently bonded to sheets of metal oxides. In the specific case of kaolin, the metal oxide layer is composed of aluminium oxide octahedra. Kaolin is a 1:1 phyllosilicate, i.e. each layer of aluminium octahedra is covalently bonded to one layer of silicon tetrahedra. The double, covalently-bound layers are linked together by weak hydrogen bonds.

The chemical composition of hydrated kaolin is $Al_4Si_4O_{10}(OH)_8$, also expressed as $Al_2Si_2O_5(OH)_4$. However, there are several polymorphs of kaolin, i.e. minerals of very similar elementalcomposition but which differ by their crystalline arrangement. These polymorphs are halloysite, nacrite and dickite.

As such, hydrated kaolin theoretically could be considered a structural isomer of its polymorphs. However, the crystalline structures of kaolin and its polymorphs are radically different. In geological terms each polymorph is an independent mineral belonging to the phyllosilicates group.

Once dehydrated through calcination, the chemical formula of kaolin is $Al_4Si_4O_{14}$ and there are no structural isomers of calcined kaolin.

Stereoisomerism:

Kaolin is inorganic and does not possess carbon atoms. Therefore Kaolin possesses neither chiral carbon atoms that could give rise to enantiomers, nor carbon-carbon double bonds that could give rise to diastereomers.

Kaolin is a solid of infinite two-dimensional structure without centres of symmetry. Therefore there are no optical isomers of kaolin.

2 REFERENCES

Bergaya F. & G. Lagaly (Eds.), 2013, Handbook of Clay Science Second edition. *Development in Clay Science 5.* Elsevier, 1686pp (2 volumes).