Claims

1. A method for controlling the volume expansion of a hydraulically setting composition comprising steel making slag, said method including a step of adding a silica source to said composition,
characterized in that it additionally comprises a step of adding an additive selected from the group consisting of sodium chloride, potassium chloride, magnesium chloride, calcium chloride, lithium hydroxide, lithium carbonate, sodium hydroxide, potassium hydroxide, sodium carbonate, potassium carbonate, sodium bi-carbonate, finely ground calcium carbonate, alkali metal nitrates, alkali metal nitrites, alkali metal thiocyanates, alkali metal salts or earth alkali metal salts of any of citric acid, formic acid, malonic acid, acetic acid, propionic acid, malic acid, or succinic acid, alkali metal silicates, calcium silicate hydrates, sugars or sugar acids, alkanolamines, and mixtures thereof,
wherein the additive is added in an amount of 0.05 – 10 wt.-%, preferably of 0.1 – 5 wt.-%, relative to the weight of steel making slag,
and characterized in that a weight ratio of steel making slag to silica source is in the range of 1:1 – 25:1, preferably 2:1 – 20:1, more preferably 2.5:1 – 10:1, especially 2.8:1 – 5:1.

2. The method according to claim 1, characterized in that the steel making slag has a free lime content as determined according to NF EN 459-2 of not more than 5 wt.-%, preferably not more than 4 wt.-%, each based on the total dry weight of the slag.

3. The method according to claim 1, characterized in that the steel making slag has a free lime content as determined according to NF EN 459-2 of at least 5 wt.-%, preferably at least 7 wt.-%, each based on the total dry weight of the slag.

4. The method according to at least one of the preceding claims, characterized in that the steel making slag consists to at least 90 wt.-% of particles finer than 6.5 mm, preferably to at least 90 wt.-% of particles finer than 0.5 mm as measured according to ASTM C136/C136M or characterized in that the steel making slag has a particle size between 0.5 – 150 µm, preferably 0.5 – 100 µm, especially 0.5 – 70 µm as measured according to ISO 13320:2009.

5. The method according to at least one of the preceding claims, characterized in that the silica source consists to an extent of at least 20 wt.-%, preferably at least 25 wt.-% of SiO_2, relative to the total dry weight of the silica source, as determined by XRF according to ASTM D5381-93.

6. The method according to any of the preceding claims, characterized in that the silica source consists to an extent of at least 50 wt.-% of amorphous phases, based on its total dry weight.

7. The method of at least one of the preceding claims, characterized in that the silica source is selected from the group consisting of ground granulated blast furnace slag (GGBS), fly ash, silica fume, pyrogenic silica, precipitated silica, rice husk ash, volcanic ashes, pumice, zeolites, diatomaceous earth, crushed glass, recycled concrete, calcined clay, especially metakaolin, and mixtures thereof.

8. The method according to any of the preceding claims, characterized in that it additionally comprises a step of adding a sulfate source.

9. The method according to claim 8, characterized in that the sulfate source is selected from calcium sulfate hemihydrate or anhydrite.

10. The method according to at least one of claims 8 – 9, characterized in that the sulfate source is added in a dosage that will result in an amount of between 0.75 – 8 wt.-% of sulfate, preferably 1.5 – 5 wt.-% of sulfate, in each case relative to the combined dry weight of the steel making slag and the silica source.

11. The method according to at least one of the preceding claims, characterized in that the additive is selected from the group consisting of lithium carbonate, sodium carbonate, potassium carbonate, sodium bi-carbonate, finely ground calcium carbonate, alkali metal nitrates, alkali metal nitrites, alkali metal salts or earth alkali metal salts of any of citric acid, formic acid, malonic acid, acetic acid, lactic acid, propionic acid, malic acid, or succinic acid, calcium silicate hydrates, glucose, fructose, lactose, mannose, sucrose, sodium gluconate, dimethylaminoethanol, diethylaminoethanol, N-methyldiethanolamine, triethanolamine (TEA), triisopropanolamine (TIPA), Diethanol-isopropanolamine (DEIPA), Ethanol-diisopropanolamine (EDIPA), N,N,N`,N`-Tetrahydroxyethyl-ethylenediamine (THEED), and mixtures thereof, especially preferred magnesium chloride, alkali metal

nitrates, alkali metal nitrites, potassium or calcium salts of any of citric acid, malonic acid, lactic acid, or malic acid, TEA, TIPA, DEIPA, EDIPA, glucose, fructose, sucrose, sodium gluconate, and mixtures thereof.

12. The method according to at least one of the preceding claims, characterized in that the steel making slag is a basic oxygen furnace slag.

13. A hydraulically setting composition, especially a dry mortar, obtained by a method of any of claims 1 – 12.

14. The hydraulically setting composition according to claim 13, characterized in that it comprises (wt.-% are relative to the total dry weight of the composition)
    a) 1 – 90 wt.-%, preferably 5 – 75 wt.-%, especially 6 – 20 wt.-% or 25 – 75 wt.-% of steel making slag,
    b) a silica source in a dosage that will result in a weight ratio of steel making slag to silica source in the range of 1:1 – 25:1, preferably 2:1 – 20:1, more preferably 2.5:1 – 10:1, especially 2.8:1 – 5:1,
    c) optionally a sulfate source in a dosage that will result in an amount of 0.75 – 8 wt.-% of sulfate, preferably 1.5 – 5 wt.-%of sulfate, in each case relative to the combined dry weight of the steel making slag and the silica source,
    d) an additive selected from the group consisting of sodium chloride, potassium chloride, magnesium chloride, calcium chloride, lithium hydroxide, lithium carbonate, sodium hydroxide, potassium hydroxide, sodium carbonate, potassium carbonate, sodium bi-carbonate, finely ground calcium carbonate, alkali metal nitrates, alkali metal nitrites, alkali metal thiocyanates, alkali metal salts or earth alkali metal salts of citric acid, formic acid, malonic acid, acetic acid, propionic acid, malic acid, or succinic acid, especially potassium or calcium salts thereof, alkali metal silicates, calcium silicate hydrates, sugars or sugar acids, especially glucose, fructose, lactose, mannose, sucrose or sodium gluconate, alkanolamines, especially dimethylaminoethanol, diethylaminoethanol, N-methyldiethanolamine, triethanolamine (TEA), triisopropanolamine (TIPA), Diethanol-isopropanolamine (DEIPA), Ethanol-diisopropanolamine (EDIPA), N,N,N`,N`-Tetrahydroxyethyl-ethylenediamine (THEED), and mixtures thereof, in a dosage that will result in an amount of 0.05 – 10 wt.-%, preferably of 0.1 – 5 wt.-% of the additive, relative to the dry weight of steel making slag.

15. The hydraulically setting composition according to at least one of claims 13 – 14, characterized in that it is a dry composition with a content of water of less than 5 wt.-%, preferably less than 1 wt.-%, relative to the total weight of the composition.

16. The hydraulically setting composition according to at least one of claims 13 – 14, characterized in that it further comprises water in a water/powder ratio between 0.1 – 0.6, preferably 0.2 – 0.5, especially 0.2 – 0.35.

17. Use of a hydraulically setting composition according to claim 16 as a cementitious tile adhesive, a grouting material, a self-levelling underlayment, a self-levelling overlayment, a render, a repair mortar, a masonry thin join mortar or concrete, a screed, a wall leveller for interior or exterior use, a non-shrink grout, a thin joint mortar, a waterproofing mortar, or an anchoring mortar.

18. A hardened body, especially a cementitious tile adhesive, a grouting material, a self-levelling underlayment, a self-levelling overlayment, a render, a repair mortar, a masonry thin join mortar or concrete, a screed, a wall leveller for interior or exterior use, a non-shrink grout, a thin joint mortar, a waterproofing mortar, or an anchoring mortar, obtained by hardening a hydraulically setting composition according to claim 16.