Claims

1. The use of a grinding additive during the dry grinding of steel making slag, characterized in that the grinding additive is selected from mixtures of triisopropanolamine and diethanolisopropanolamine, or from mixtures of at least one of triisopropanolamine, triethanolamine, diethanolisopropanolamine, and ethanoldiisopropanolamine with at least one of diethylene glycol, glycerol, carboxylic acid, and sugar.

2. The use according to claim 1, characterized in that the steel making slag is a basic oxygen furnace slag.

3. The use according to at least one of claims 1 and 2, characterized in that the steel making slag has a content of iron oxides expressed as Fe_2O_3 of 8 – 38 w%, preferably of 10 – 30 wt.-%, and a content of sulfur expressed as SO_3 of < 1 w%, preferably < 0.5 w%, especially < 0.1 w%, in each case relative to the total dry weight of the steel making slag.

4. The use according to at least one of the preceding claims, characterized in that the grinding additive is selected from mixtures of triisopropanolamine, triethanolamine, diethanolisopropanolamine, or ethanoldiisopropanolamine with at least one of lactic acid, malonic acid, adipic acid, citric acid, galactose, glucose, lactose, maltose, sucrose, fructose, diethylene glycol, glycerol.

5. The use according to claim 4, characterized in that the grinding additive is a mixture of triisopropanolamine and citric acid, or is a mixture of triisopropanolamine and glucose, or is a mixture of triisopropanolamine and fructose, or is a mixture of triisopropanolamine and glycerol, or is a mixture of triisopropanolamine and diethylene glycol, or is a mixture of triisopropanolamine and sugar and glycerol, or is a mixture of triisopropanolamine and sugar and diethylene glycol, or is a mixture of triisopropanolamine and carboxylic acid and glycerol, or is a mixture of triisopropanolamine and carboxylic acid and diethylene glycol, or is a mixture of diethanolisopropanolamine and citric acid, or is a mixture of diethanolisopropanolamine and glucose, or is a mixture of diethanolisopropanolamine and fructose, or is a mixture of diethanolisopropanolamine and glycerol, or is a mixture of diethanolisopropanolamine and diethylene glycol, or is a mixture of diethanolisopropanolamine and sugar and glycerol, or is a mixture of diethanolisopropanolamine and sugar and diethylene glycol, or is a mixture of diethanolisopropanolamine and carboxylic acid and glycerol.

6. The use according to any of the preceding claims, characterized in that the grinding additive additionally comprises a defoamer, preferably tri-isobutyl phosphate.

7. The use according to at least one of the preceding claims, characterized in that the amount of water present during grinding is not higher than 1 w%, preferably 0.1 w%, more preferably 0.06 w%, relative to the total dry weight of the slag.

8. The use as claimed in at least one of the preceding claims, characterized in that the grinding additive is added to the steel making slag before and/or during grinding in a total amount of between 0.001 - 3 w%, preferably 0.002 – 1 w%, more preferably 0.01 – 0.1 w%, in each case relative to the total dry weight of the slag.

9. The use as claimed in at least one of the preceding claims, characterized in that the grinding is done in an attrition mill or a compressive grinder, especially in a ball mill or in a vertical roller mill.

10. A ground steelmaking slag obtained by dry grinding a steel making slag in the presence of a grinding additive selected form mixtures of triisopropanolamine and diethanolisopropanolamine, or from mixtures of at least one of triisopropanolamine, triethanolamine, diethanolisopropanolamine, and ethanoldiisopropanolamine with at least one of diethylene glycol, glycerol, carboxylic acid, and sugar.

11. A ground steelmaking slag according to claim 10, characterized in that the steel making slag is a basic oxygen furnace slag and in that the grinding additive is selected from a mixture of triisopropanolamine and citric acid, or a mixture of triisopropanolamine and glucose, or a mixture of triisopropanolamine and fructose, or a mixture of triisopropanolamine and glycerol, or a mixture of triisopropanolamine and diethylene glycol, or a mixture of triisopropanolamine and sugar and glycerol, or a mixture of triisopropanolamine and sugar and diethylene glycol, or a mixture of triisopropanolamine and carboxylic acid and glycerol, or a mixture of triisopropanolamine and carboxylic acid and diethylene glycol, or a mixture of diethanolisopropanolamine and citric acid, or a mixture of diethanolisopropanolamine and glucose, or a mixture of diethanolisopropanolamine and fructose, or a mixture of diethanolisopropanolamine and glycerol, or a mixture of diethanolisopropanolamine and diethylene glycol, or a mixture of diethanolisopropanolamine and sugar and glycerol, or a mixture of diethanolisopropanolamine and sugar and diethylene glycol, or a mixture of diethanolisopropanolamine and carboxylic acid and glycerol.

12. Construction material, especially a mortar or concrete, comprising a ground steelmaking slag as claimed in claim 10 or 11.

13. A construction material as claimed in claim 12 comprising or consisting of
a) 5 – 95 w% of a ground steel making slag;
b) 5 – 95 w% of at least one mineral binder, preferably selected from the group consisting of cement, gypsum, lime, latent hydraulic binders, pozzolanes, and geopolymers;
c) optionally 15 – 85 w% of aggregates;
d) optionally 0.1 – 10 w% of further additives; and
e) optionally water in an amount to realize a mass ratio of water : mineral binder between 0.1 – 0.8, preferably 0.25 – 0.6, especially 0.3 – 0.5.

14. A method to increase the efficiency of the dry grinding of steel making slag, characterized in that the steel making slag is dry ground together with an additive selected from mixtures of triisopropanolamine and diethanolisopropanolamine, or from mixtures of at least one of triisopropanolamine, triethanolamine, diethanolisopropanolamine, and ethanoldiisopropanolamine with at least one of diethylene glycol, glycerol, carboxylic acid, and sugar,
and that the additive is added to the slag prior and/or during grinding.

15. A method to increase the early strength of a cementitious material comprising a ground steel making slag, characterized in that an additive is added to said slag prior and/or during the dry grinding of said slag and characterized in that the additive is a mixture of triisopropanolamine and glycerol, or is a mixture of triisopropanolamine and diethylene glycol, or is a mixture of diethanolisopropanolamine and glycerol, or is a mixture of diethanolisopropanolamine and diethylene glycol, wherein the respective weight ratio is 9:1 – 1:1.