ANALYSENZERTIFIKAT

Analyses of Lot No: 1182722 MHD 2027-11

Material designation

Material	Natural Zeolite
Chemical description	Hydrated alumosilicate of alkali metals and alkaline earth metals
Mineral	Clinoptilolite
Structure	Tectosilicate
Empirical formula	$(Ca,K_2,Na_2,Mg)_4Al_8Si_{40}O_{96}.24H_2O$

Physical and mechanical properties

Softening temperature	1 260 °C	**Porosity**	24 - 32 %
Melting temperature	1 340 °C	**Effective pore diameter**	0.4 nm (4 angstrom)
Flow temperature	1 420 °C	**Relative density**	70%
Compression strength	33 MPa	**Brightness**	70%
Specific weight	2 200 - 2 440 kg/m³	**Mohs hardness**	1.5 - 2.5
Volume weight	1 600 - 1800 kg/m³	**water absorbing capacity**	34 - 36 %
Appearance and odour	grey-green, odourless	**pH-value**	6.8 - 7.2

Data on reactivity

Resistance	acid and base proof	**Dangerous decomposition**	none
Thermic stability	up to 400 °C	**Dangerous polymerization**	none
Solubility in water	none	**Toxicity**	nontoxic

Chemical composition

SiO_2	64.18 - 75.50 %	**MgO**	0.29 - 1. 43 %
Al_2O_3	10.93 - 14.80 %	**Na_2O**	0.10 - 2.97 %
CaO	1.43 - 11.68 %	**TiO_2**	0.08 - 0.39 %
K_2O	1.24 - 4.24 %	**Hg**	< 0.007 mg/kg
Fe_2O_3	0.12 - 2.45 %	**As**	1.23 mg/kg*
Pb	13.5 mg/kg *	**Cd**	< 0.05 mg/kg
		Si/Al	4.8 - 5.4

*) ± 20% measurement uncertainty;

Mineralogical composition (typical)

Clinoptilolite	84%	**Illite**	Spuren
Cristobalite	4%	**Feldspat**	7%
Biotit	1-2%		
Quarz	3%		

Ionic exchange capability

Total exchange	Ca^{2+}	0.64 - 0.98 mol/kg	K^+	0.22 - 0.45 mol/kg
	Mg^{2+}	0.06 - 0.19 mol/kg	Na^+	0.01 - 0.19 mol/kg
Total exchange capacity				1.2 - 1.5 mol/kg
Sorption of steam by dehydrated rock		at relative humidity 52 %		7.5 - 8.5 g H_2O/100g
		at relative humidity 98 %		13.5-14.5 g H_2O/100g

Microbiological testing

Aerob mesophile microbes:	<100 cfu/g
Eterobacteriaceen	<10 cfu/g
Escherichia coli	<10 cfu/g
Yeast	<10 cfu/g
Mould	<10 cfu/g
Salmonella	not detectable in 25g
Staphylococcus aureus	not detectable in 1g

Signature, Quality Management

Date 17.08.2023

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