

Determination of the absorbing capacity of FLUISORB[®] and the storage stability of FLUISORB[®] contaminated with different liquid chemicals

Method

The absorbing capacity is determined following the requirements of DIN 53 923.

The storage stability of contaminated FLUISORB[®] is determined as follows:

After determination of the absorbing capacity of FLUISORB[®] the saturated binder will be filled up with test liquid to approx. 15 mm over the level of the sample in a beaker. These conditions remain for at least 24 hours in the beaker without agitating. If there is no recognizable reaction or change, the storage stability is evaluated as „positive “.

Definition

The Absorbing Capacity is defined as the volume of a liquid chemical which is absorbed by FLUISORB[®] if stored in a test liquid under defined conditions.

The Absorbing Capacity is specified in two ways: uptake of a liquid as a percentage [%] and as a value of absorption [kg/kg] in relation to the dry weight of the oil binder.

Devices

Cylindrical plastic sieve (mesh size 1.5mm) with a diameter of at least 140mm

Tray with test liquid to accommodate the sieve containing FLUISORB[®]

Top-loading balance

Laboratory tray to weigh the saturated FLUISORB[®]

Stopwatch, Beaker

Sampling

The FLUISORB[®] sample is adapted to standard reference atmosphere.

FLUISORB[®] is an environmentally friendly approved Oil Absorbent, made of 100% renewable raw materials produced by KALLE GmbH Wiesbaden, Germany.

FLUISORB[®] is certified by the accredited German Materialprüfungsamt Nordrhein-Westfalen for oil absorption Type III R (Ground, Industrial purposes, Streets and Traffic Areas) according to the German legal directive "LTWS - 27", test no. 22000628708.

Procedure

- Weigh the sample with an accuracy of ± 0.1 g = in grams [g] of dry mass
- Put the sieve containing the sample into the tray filled with the liquid chemical; the surface of the sample should be located approx. 20mm below the liquid level.
- After an exposure time of 60 ± 3 seconds, the sieve with the sample is lifted out of the liquid held up to drop off for 120 ± 3 seconds.
- Remove the sample from the sieve and put it in a tared (set at zero) laboratory tray.
- Weigh the sample with the tared laboratory tray.
- Weight of the wet (soaked) sample = in grams [g] of wet mass
- Record value.

Evaluation

Calculation of the liquid absorption of FLUISORB[®]:

$$\text{Liquid absorbance (\%)} = \frac{\text{wet mass (g)} - \text{dry mass (g)}}{\text{dry mass (g)}} \times 100$$

$$\text{Liquid absorbance (kg/kg)} = \frac{\text{wet mass (g)} - \text{dry mass (g)}}{\text{dry mass (g)}} \times 100$$

The absorbing capacity of FLUISORB[®] and the storage stability of contaminated FLUISORB[®] have been tested as a chemical bonding agent with the following chemical liquids (according to the German directive LTWS - 31; March 2001):

- ❖ **Strong Acids: e.g. Sulphuric acid 96%; group: A**
- ❖ **Alkali substances: e.g. Sodium hydroxide solution, Ammonium hydroxide and Triethanolamine; group: B**
- ❖ **Flammable fluids: e.g. Regular Gasoline, Tetrahydrofuran, Toluene, Ethanol/Alcohol, Paint thinner; group: F**
- ❖ **Nonpolar organic fluids: e.g. Light fuel oil/Diesel, Heavy duty oil, Engine oil, Hydraulic oil, Gasoline; group: H**
- ❖ **Oxidative Substances: e.g. Hydrogen Peroxide, Chlorine bleaching, Peracetic acid; group: O**
- ❖ **Aqueous and polar fluids: e.g. Glycol, Latex Paint, Urea; group: P**

Results

see the summary tables, Pages 5 - 9

Final Conclusion

Concerning the specified test liquids of the groups B, F, H, O and P, the absorbing capacity and the storage stability of contaminated FLUISORB[®] exceeds the market standards by far.

For the group of A: „Strong Acids“ FLUISORB[®] is not suitable.

The FLUISORB[®] absorption material is made of **renewable raw materials**; the non-contaminated material is fully biodegradable, environmentally compatible and will rot naturally. It is chemically neutral, non-toxic, non-staining and fulfils the requirements of the occupational medicine as well as the environmental tests of the German Hygiene Institute, another accredited institute.

KALLE Oil Absorbent FLUISORB®

Group "B": Alkali substances

Minimum Absorbing Capacity: 1,0 kg liquid test chemicals per kg FLUISORB®

Results

Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Sodium hydroxide	Sodium hydroxide	Sodium hydroxide	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	163,4	153,4	1534	15,34	Positive
Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Ammoniac	Ammoniac	Ammoniac	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	158,7	148,7	1487	14,87	Positive
Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Triethanolamine	Triethanolamine	Triethanolamine	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	119,1	109,1	1091	10,91	Positive

Cutline:

Liquid test chemicals:

Sodium hydroxide solution, 33%

Ammoniac=Ammonium hydroxide, 25%

Triethanolamine, 85%

KALLE Oil Absorbent FLUISORB®

Group "F": Flammable fluids

Minimum Absorbing Capacity: 0,5 kg liquid test chemicals per kg FLUISORB®

Results

Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Regular gasoline	Regular gasoline	Regular gasoline	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	47,6	47,6	37,6	3,76	Positive
Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Tetrahydrofuran	Tetrahydrofuran	Tetrahydrofuran	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	65,1	55,1	551	5,51	Positive
Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Toluene	Toluene	Toluene	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	59,6	49,6	496	4,96	Positive
Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Ethanol	Ethanol	Ethanol	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	57,1	47,1	471	4,71	Positive
Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Thinner	Thinner	Thinner	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	58,4	48,4	484	4,84	Positive
Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Ethyl alcohol	Ethyl alcohol	Ethyl alcohol	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	62,4	52,4	524	5,24	Positive

Cutline:

Liquid test chemicals:

instead of n-Hexan : Regular gasoline, DIN EN 228 Ethanol, 96%
 Tetrahydrofuran (THF) Thinner: Paint thinner, includes Xylol
 Toluene Ethyl alcohol

KALLE Oil Absorbent FLUISORB®

Group "H": **Nonpolar organic fluids**

Minimum Absorbing Capacity: 0,36 kg liquid test chemicals per kg FLUISORB®

Results

Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Engine oil	Engine oil	Engine oil	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	94,9	84,9	849	8,49	Positive
Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Hydraulic oil	Hydraulic oil	Hydraulic oil	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	75,7	65,7	657	6,57	Positive
Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Light fuel oil/Diesel	Light fuel oil/Diesel	Light fuel oil/Diesel	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	77,6	67,6	676	6,76	Positive
Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Regular Gasoline	Regular Gasoline	Regular Gasoline	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	51,1	41,1	411	4,11	Positive
Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Mixture	Mixture	Mixture	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	77,1	67,1	671	6,71	Positive

Cutline:

Liquid test chemicals:

Engine oil 15W-40

Hydraulic oil HLP 46

Light fuel oil/Diesel, DIN EN 590

Regular Gasoline, DIN EN 228

Mixture = 20% Engine oil + 20% Regular gasoline + 20% Diesel + 20% Hydraulic oil + 20% Anti-freeze protection

KALLE Oil Absorbent FLUISORB®

Group "O": Oxidative Substances

Minimum Absorbing Capacity: 0,5 kg liquid test chemicals per kg FLUISORB®

Results

Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Hydrogen Peroxid	Hydrogen Peroxid	Hydrogen Peroxid	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	155,6	145,6	1456	14,56	Positive
Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Chlorine Bleaching	Chlorine Bleaching	Chlorine Bleaching	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	178,8	168,8	1688	16,88	Positive
Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Peracetic Acid	Peracetic Acid	Peracetic Acid	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	115,1	105,1	1051	10,51	Positive

Cutline:

Liquid test chemicals:

Hydrogen Peroxid , 35%

instead of Chlorine Bleaching: 15% active Chlorine: Dan Chlorix Sodiumhydrochlorine, 28%

Peracetic Acid, 15%

KALLE Oil Absorbent FLUISORB®

Group "P": Aqueous and Polar Fluids

Minimum Absorbing Capacity: 1,0 kg liquid test chemicals per kg FLUISORB®

Results

Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			M.-ethylene glycol	M.-ethylene glycol	M.-ethylene glycol	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	112,3	102,3	1023	10,23	Positive
Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Latex Paint	Latex Paint	Latex Paint	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	196,3	186,3	1863	18,63	Positive
Absorbent	Dry mass	Wet mass	Absorption	Absorption	Absorption	Storage stability
			Liquid manure	Liquid manure	Liquid manure	24 Hours
	[g]	[g]	[g]	[%]	[kg/kg]	
FLUISORB®	10	134,1	124,1	1241	12,41	Positive

Cutline:

Liquid test chemicals:

Monoethylene glycol = M.-ethylene glycol

Latex Paint white: Ingredients: Synthetic dispersion, Titanium dioxide, Calcite, Silicates, Water, Additives, Preservative agents

instead of Liquid manure: 1% urea as alternative fluid