

PRZEDSIĘBIORSTWO TECHNICZNO – HANDLOWE

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PROMOTOR EKOLOGII

PRODUCT SPECIFICATION

Product name: Halloysite Dunino CSW - component of plastics and paints

CAS Number: 1332-58-7 Chemical formula: Al₂Si₂O₅(OH)₄·2H₂O Formula weight: 294,19 g/mol Appearance (Color): beige Appearance (Form) : powder BHT Surface Area : $65 \text{ m}^2/\text{g}$ Bulk density : $650-750 \text{ kg/m}^3$ pH : 6,5-7,5Composition: mixture of nanotubes and nanoplatelets (s. Fig. 1)



Fig.1 Microscopic SEM view of Halloysite Dunino CSW

Dimensions of nanoparticles:

nanotubes: diameter: 30-100 nanometers ; length : 0,5 -2 mikrometers nanoplatelets: lenght/ width : 100-300 nanometers; thickness : 1-5 nanometers Supplier : PTH Intermark , Poland

Chemical composition:

 $\begin{array}{l} Al_2O_3\text{-} 34 \text{ +/-} 1\%;\\ SiO_2\text{-} 37 \text{ +/-} 1\%,\\ Fe_2O_3\text{-} 21 \text{ +/-} 1\%,\\ TiO_2\text{-} 2,5 \text{ +/-} 1\%,\\ CaO\text{-} 0,5\% \text{ +/-} 0,1\%\\ K_2O - 0,07\text{ +/-} 0,01\%\\ Na_2O \text{-} 0,02\% \text{ +/-} 0,01\%\\ SO_3 - 0,05\text{ +/-} 0,02\%\\ Cl < 0,01\%\\ LOI - 14,2\%\\ \end{array}$

PTH Intermark warrants, that at the time of the quality release or subsequent retest date this product conformed to the information contained in this publication. For further inquiries, please contact PTH Intermark. Purchaser must determine the suitability of the product for its particular use.

Applications:

Halloysite CSW can be applied as a component of plastics and paints.

It was tested as the component of various polymer composites (polar and non-polar). The purpose of its applications were different in various cases: fire retardancy, flame resistance, improvement of mechanical properties, reduction of oxygen permeability. Because halloysite is polar- it needs the functionalization to a specific case by means of various surface activators for non-polar matrices. The amount of additive, type of surface activator, production parameters depend of the kind of polymer and demanded features of the composite.

Nanotubes and nanoplates form grain agglomerates connected mainly by weak van der Waals forces. A grain size of a few micrometers consists of hundreds of nanoplatelets and nanotubes and they should be disintegrated and good dispersed in the matrix. The experience shows that this is very difficult to achieve in conventional extruders. Very good results were obtained in the extrusion process by means of Entex planetary extruder. Fig. 2 shows a microspopic SEM view of a composite with good disaggregation and dispersion of halloysite naoplatelets and nanotubes in such extruder.



Fig. 2 Microscopic SEM view of the composite with CSW halloysite filler (Entex planetary extruder) The nanoplatelets and nanotubes are disaggregated, correctly dispersed and strongly connected with matrix.

The Young's modulus of halloysite nanotubes and nanoplatlets is approx. 300 GPa, i.e. it is approx. 100 times greater than the modulus of typical pristine plastics.

Full use of halloysite properties results in significant improvement of composite parameters with additive doses of 2-5%.

Following effects are achieved when halloysite is used in paints:

1/ very good coverage and adhesion

2/ high mechanical properties

3/ resistance to discoloration, weather resistance and color fade.

4/ flexibility

5/ tolerant of surface expansion and contraction without cracking.

6/ excellent UV

Halloysite can be successfully used for:

- water and solvent based paints,
- exterior and interior paints
- anicorrosive paints,
- special paints (eg. biocide paints).



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COA on natural Halloysite DUNINO - CSW

This is to certify that the following chemical analysis was obtained on a sample of Hallovsite Dunino (Poland)	
Al ₂ O ₃ - 34 +/- 1%;	$K_2O - 0,07 + -0,01\%$
SiO ₂ - 37 +/- 1%,	Na ₂ O -0,02%+/- 0,01%
Fe ₂ O ₃ - 21 +/- 1%,	SO ₃ -0,05+/-0,02%
TiO ₂ - 2,5 +/- 1%,	Cl <0,01%
CaO- 0,5% +/-0,1%	LOI – 14,2%

Granulation – as below

Natural color: beige/gray

