EUROPE, MIDDLE EAST
AND AFRICA

Kisuma Chemicals BV
Billitonweg 7
9641 KZ Veendam
The Netherlands
Tel. +31 598 666 766
www.kisuma.com

ASEAN, INDIA, PAKISTAN,
BANGLADESH AND OCEANIA

Kisuma Asia Singapore Pte. Ltd.
143 Cecil Street
#03-01 GB Building (Suite 307)
Singapore 069542
Tel. +65 6532 0246
www.kisuma-sg.com

CHINA

Kisuma Chemical Trading (Shanghai) Co., Ltd
Room 1006, No. 2201 Yan'an Road (W),
Shanghai 200336
China
Tel. +86 021 3209 8077
www.kyowa-chem.co.jp

NORTH- AND LATIN AMERICA

Kisuma Americas, Inc
1235 North Loop West, Suite 909
Houston, Texas, 77008
USA
Tel. +1 832 460 5130
www.kisuma.us

JAPAN AND KOREA

Kyowa Chemical Industry Co., Ltd
4-7, 3-Chome, Nihonbashi-Muromachi
Chuo-Ku, Tokyo, 103-0022
Japan
Tel. +81 362 023 011
www.kyowa-chem.co.jp

KISUMA
A subsiary of Kyowa Chemical Industry

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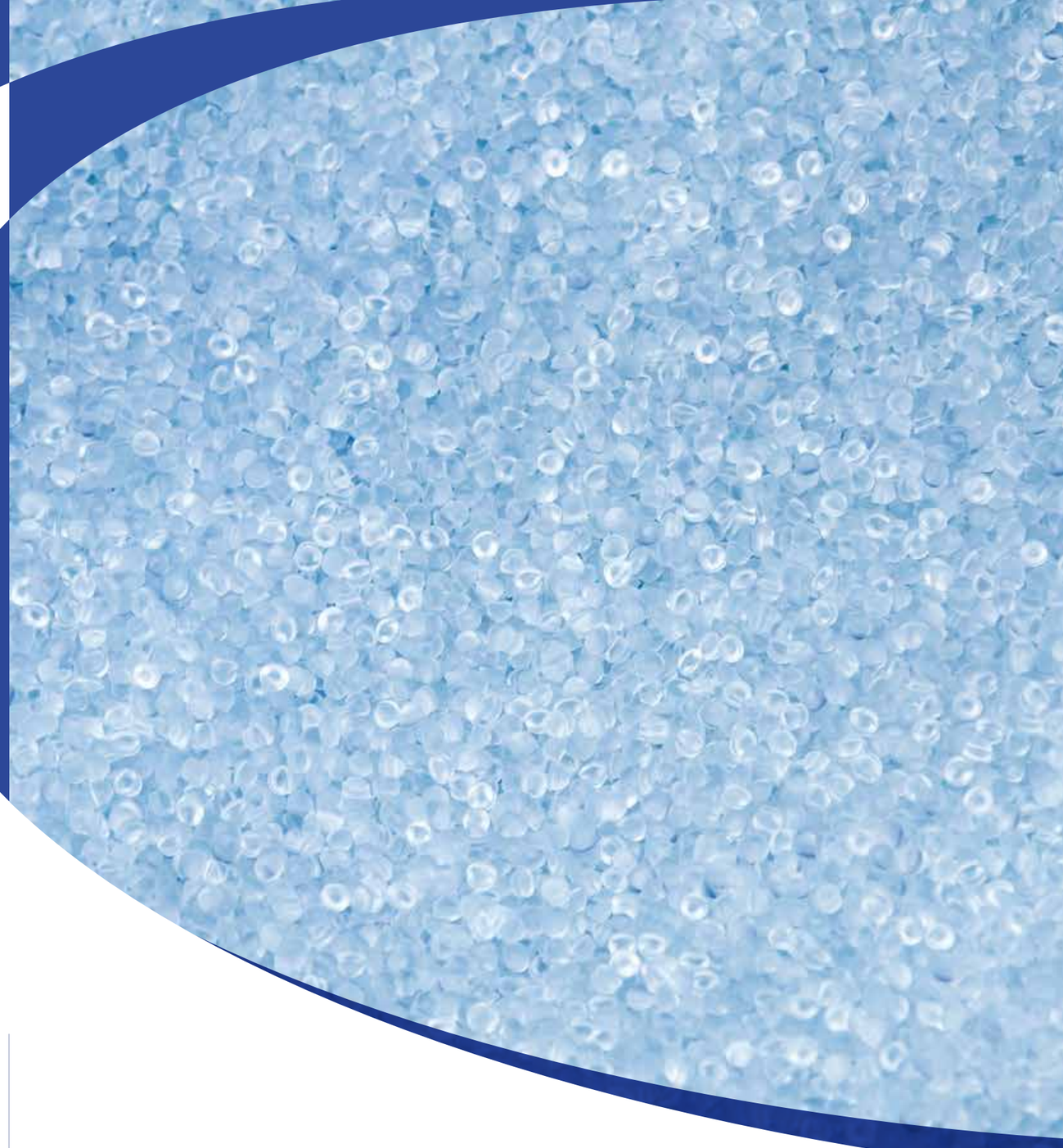
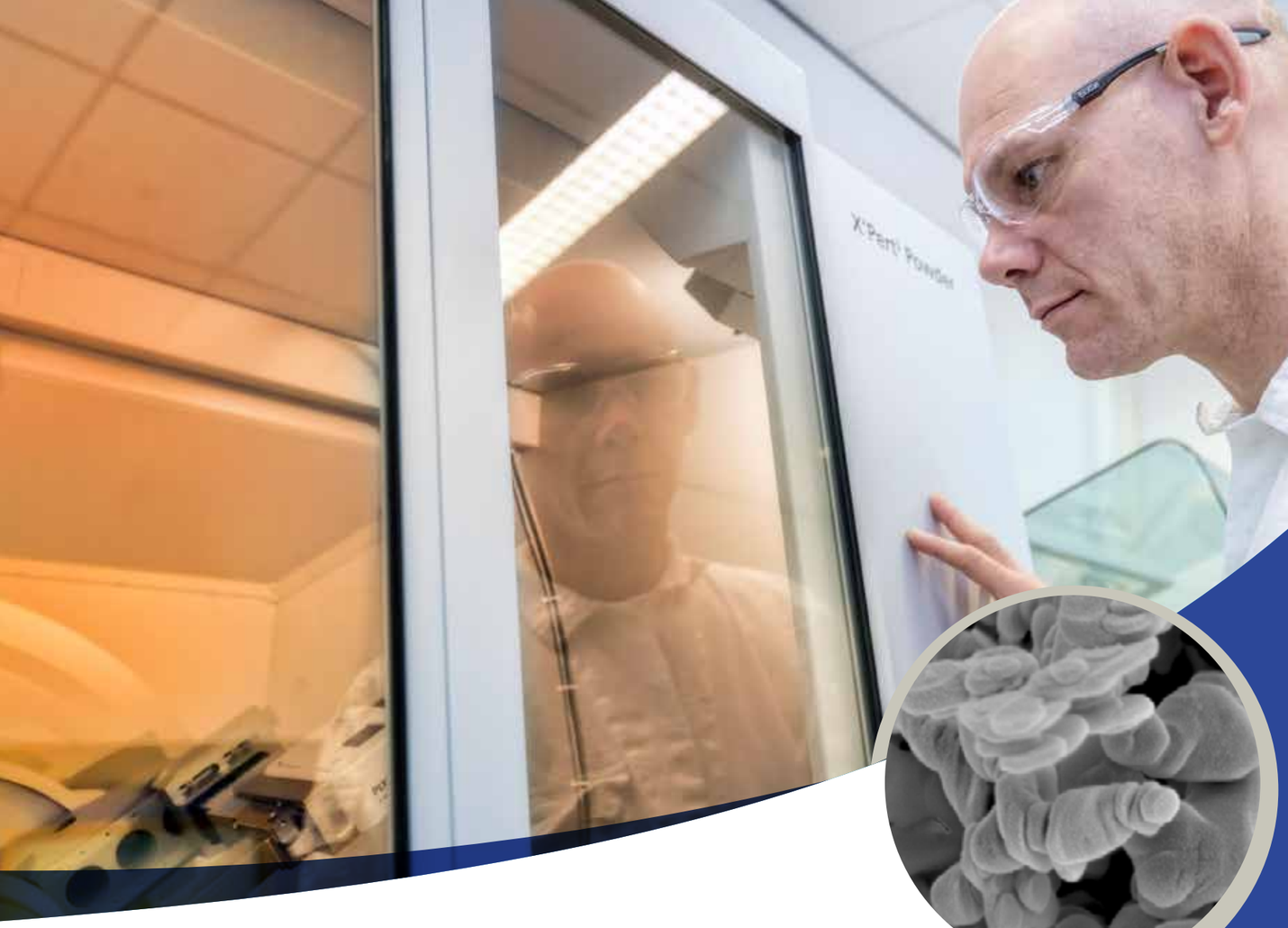


DHT-4V®

ACID SCAVENGER FOR POLYMERS

KISUMA



Through irreversible deactivation of acidic substances, DHT-4V® ensures your polymer systems perform to their full potential. Our products protect your assets from corrosion, prevent deactivation of functional additives, increase hydrolytic stability and solve odor problems.

DESIGNED FOR PERFORMANCE

Food Contact Approved, High Performance Acid Scavenger for Polyolefins, Elastomers and Other Polymers from the Inventors of Synthetic Hydrotalcite.

DHT-4V® is the flagship product of our branded range of synthetic hydrotalcite-like materials. It is considered to be the industry standard for deactivation of acidic residues in polyolefins. DHT-4V® is generally acknowledged to be the best of its kind. The superiority of DHT-4V® results from its particular mechanism of adsorbing acids, based on anion exchange. Acidic substances are firmly bound within the interlayer region of DHT-4V®, which renders them harmless. Because intercalated substances are completely immobilized, problems resulting from migration of undesired substances are prevented.

DHT-4V® is superior to alternative stabilizer products, such as Calcium Stearate (Ca-St), for the following reasons:

+ DHT-4V® is 3 times more effective as Ca-St. Impact on physical properties of polymers is minimized. Superior haze, gloss and transparancy properties can be achieved with DHT-4V®.
+ By using DHT-4V®, stearic acid vapors can be eliminated.
+ With DHT-4V®, the amount of water carry-over is significantly less than with Ca-St.
+ DHT-4V® has excellent dispersion properties, resulting from its sub-micron particle size and surface treatment.

TYPICAL PROPERTIES AND SEM OF DHT-4V®

Al (as Al_2O_3)	19 w/w%
Mg (as MgO)	34 w/w%
Molar Ratio (MgO/Al_2O_3)	4.3
Loss on Drying (105 °C 1 hr)	0.3 w/w%
Specific Surface Area (BET)	11 m2/g
Particle Size Distribution	Average: 0.5 µm
	> 1 µm: min. 85 %
	> 5 µm: 0.0 %
Heavy Metals	5 ppm
Fe	40 ppm
Refractive Index	1.5
Hardness (Mohs)	2.0-2.5
Density	2.1
Apparent specific gravity	400-500 g/L *
pH of Suspension	8.5

* less compacted version available

SUPERIOR ACID SCAVENGING

DHT-4V® has anion exchange capacity and a neutralizing effect due to its alkalinity. In addition, the dispersion characteristics of DHT-4V® are excellent which further contributes to its high functionality. This basically means DHT-4V® can tackle problems related to a wide range of acids in polymer systems. Examples include but are not limited to: Chloride (Cl^-), Bromide (Br^-), Fluoride (F^-), Nitrate (NO_3^-), Hydroxide (OH^-), Iodide (I^-), Acetate (CH_3COO^-), Acrylate ($CHCOO^-$), Formate (HCO_2^-), actate ($CH_3CH(OH)CO_2^-$), Benzoate ($C_7H_5O_2^{2-}$), Titanate (TiO_3^{2-}), Sulfate (SO_4^{2-}), Selenate (SeO_4^{2-}), Molybdate (MoO_3^{2-}), Phtalate ($C_8H_4O_4^{2-}$), Maleate ($C_4H_4O_4^{2-}$), Telluride (Te^{2-}), Borate BO_3^{3-}), Citrate ($C_6H_5O_7^{3-}$), Phosphate (PO_4^{3-}), Phosphite (PO_3^{3-}), Antimonide (Sb^{3-}).

APPLICATIONS

- Deactivation of residual acidic substances from the polymerization process used to produce Polyolefins. This significantly reduces corrosion damage of processing equipment and of the polymer itself.
- Protection of functional additives, such as phenolic and phosphite antioxidants and Hindered Amine Light Stabilizers (HALS), from deactivation. This increases long-term integrity and stability of polymer products.
- Scavenging of free halogen ions deriving from radicals in halogenated flame retardants. This prevents polymer degradation.
- Acid acceptor in Halogenated Rubbers such as CR, CSM, FKM and NBR, where high water resistance is required.
- Capturing residual acids in Maleic Anhydride grafted polymers, preventing odor and corrosion problems.
- Rendering acids originating from monomers in bioplastics inert, increasing hydrolytic stability.

INVENTORS OF SYNTHETIC HYDROTALCITE

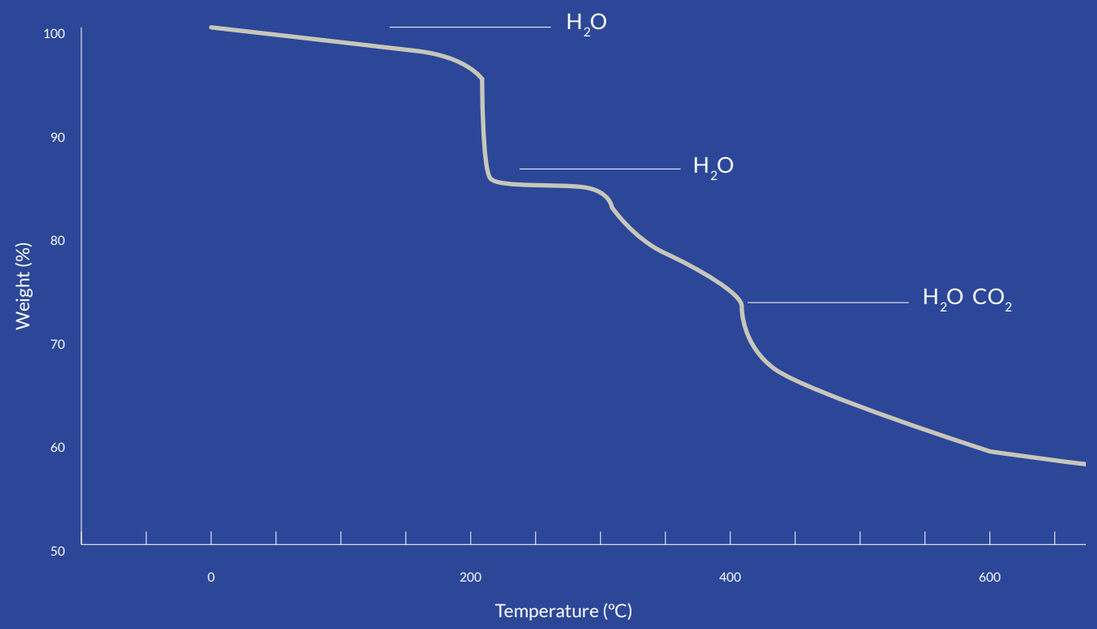
Our parent company, is the inventor of the industrial synthesis method of hydrotalcite. The original product, DHT-4A® is on the approval list of practically all polyolefin technology providers worldwide. DHT-4V® is a 100% equivalant product, with a vegetable based surface agent.

ALTERNATIVE PRODUCTS

Our extensive experience with the implementation of DHT-4V® in polymer applications has resulted in the development of a variety of alternative products that may fit your needs.

1. DHT-4A-2: Dehydrated grade for higher thermal stability (180-230 °C).
2. DHT-4C: Uncoated and Calcined grade for high thermal stability (>300 °C).
3. KW2200: Solid MgO-Al_2O_3 solution.
4. ZHT-4V: Product with implemented Zinc, for improved color properties of polymers.
5. Kisuma 5A: Highly pure and fine Magnesium Hydroxide (coated) used as flame retardant.
6. Kyowamag® 150: Magnesium Oxide used to improve vulcanization, anti-scorching and acid neutralisation in synthetic Rubber.

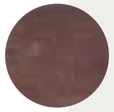
An important consideration in the selection of the most suitable product is the required thermal stability. As can be seen in the TGA below, the crystal water of DHT-4V® (≈ 12 w/w%) starts to dehydrate at approximately 180 °C. The typical hydrotalcite structure remains intact until about 350 °C. At higher temperatures, a MgO-Al_2O_3 mixed metal oxide is formed which is stable up to 800 °C. Interestingly, this material has a memory effect. The hydrotalcite lattice can be redeemed by hydration. This effect is lost during calcination above 800 °C, which eventually leads to the formation of MgO and $MgAl_2O_4$.



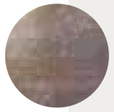
ANTI-CORROSION TEST

The pictures above are the result of a demonstration of the functionality of DHT-4V®. In the test, soft iron plates* were put into PP pellets and placed in an oven for 20 hours. The plates were then hung from the cap of a glass bottle (500 ml), which contained a small amount of water. The plates were kept at 20 °C for 7 days and then checked visually. The lack of rust formation when using small amounts of DHT-4V® is obvious.

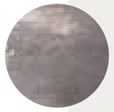
* Composition of Iron Plates - C: 0.15%, Si: 0.24-0.25%, Mn: 0.95%, P: 0.014%, S: 0.015%, Fe: The balance



Appearance at DHT-4V® dosage of **0 ppm**



Appearance at DHT-4V® dosage of **100 ppm**

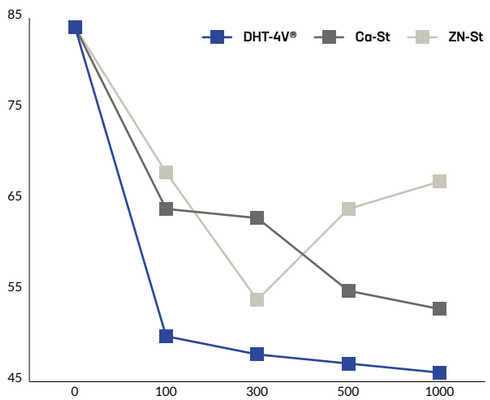


Appearance at DHT-4V® dosage of **300 ppm**

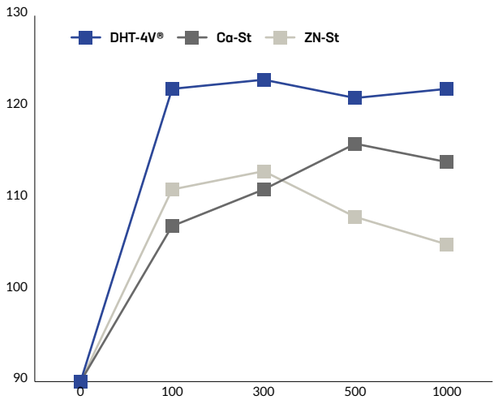
EFFECT ON POLYMER PROPERTIES AND PROCESSABILITY

The typical dosage of DHT-4V® in polypropylene is 10 times the residual Cl^-. The test data below has been generated with the following formulation. PP (30 ppm Cl^-): 100 phr, primary phenolic antioxidant: 500 ppm, secondary phosphite antioxidant: 500 ppm, DBS: 3000 ppm, Acid Scavenger: See graphs. The mixture was pelletized in an extruder at 230 °C and pressed to sheets of 3 mm at 230 °C / 3 minutes.

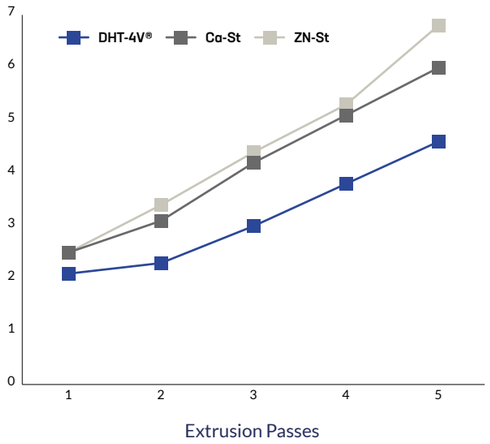
HAZE (%)



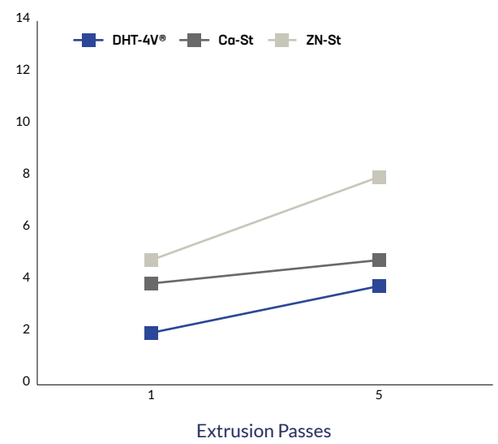
GLOSS



MFI (G/10 MIN)



Δ YELLOWNESS



CONTINUITY THROUGH INNOVATION

PRODUCT AND SAFETY INFORMATION

Chemical Formula	$Mg_{4.3}Al_2(OH)_{12.6}CO_3 .mH_2O$
Chemical Name of Main Active Ingredient	Magnesium Aluminium Hydroxide Carbonate (Hydrate)
EC number of Main Active Ingredient	234-319-3
CAS number of Main Active Ingredient	1097-59-9
REACH Reference Number	01-2119489902-26-0000
Food Contact Materials (EU)	PM/REF Number 34690
FDA Status (USA)	GRAS in plastics for food contact applications
Available Standard Packaging materials	20 kg PE bags, 40 bags (800 kg) per pallet
	500 kg Big Bags, 2 bags (1,000 kg) per pallet