



Competence
in Metal Salts –
Your Solution

Lohtragon®

Crystallizing Solutions

www.lohtragon.com



Your Value

- ◆ Broad competences in manufacturing and modifying metal salts
- ◆ Proven high performance range
- ◆ Tailor-made developments

Lohtragon® – Our Brand for Metal Salt Competence – Your Solution

Established, Diverse, Customized, Competent

The proven high performance metal salt range for industrial applications manufactured under the Lohtragon® brand provides solutions for a broad variety of market segments and applications. Your individual requirements combined with our Lohtragon® competence in metal salts offers you custom modifications and new developments. Lohtragon® metal salts provide solutions for your challenges.

Discover your benefits on the next pages of our competence brochure!

Explore Lohtragon® on our website: www.lohtragon.com



Lohtragon® – Our Metal Salt Range

Discover below our established high performance Lohtragon® range for industrial applications. Benefit from the metal salt competence of our experts for your individual recommendation and support in the preselection of the most suitable product and quality.

Product	Type	Used substance	Product description*
Aluminium			
Lohtragon® K87	3	Aluminium Nitrate Solution	solution approx. 61 %
Lohtragon® L87	6	Aluminium Lactate Solution	solution approx. 30 %
Ammonium			
Lohtragon® B65	9	Triammonium Citrate	crystals chem. pure
Lohtragon® B72	12	Ammonium Formate	crystals chem. pure
Lohtragon® B75	16	Diammonium Hydrogen Citrate	crystals chem. pure
Lohtragon® O05	20	Ammonium Acetate	crystals chem. pure
Calcium			
Lohtragon® B42	24	Tricalcium Citrate, anhydrous	fine powder chem. pure
Lohtragon® B68	20	Calcium Formate	crystals chem. pure
Lohtragon® O01	172	Calcium Acetate	powder chem. pure
Lohtragon® O43	25	Calcium Nitrate 4-hydrate	crystals chem. pure
Copper			
Lohtragon® K01	30	Copper(II) Hydroxide Carbonate	powder chem. pure
Lohtragon® K02	27	Copper(II) Acetate 1-hydrate	crystalline powder chem. pure
Lohtragon® K11	5	Copper(II) Nitrate 3-hydrate	crystals chem. pure
Iron			
Lohtragon® C05	29	Ferric Citrate	powder chem. pure
Lohtragon® C07	66	Ferric Ammonium Citrate, brown	powder chem. pure
Lohtragon® C08	3	Ferric Sodium Citrate Solution	solution approx. 55 %
Lohtragon® C73	171	Ferrous Gluconate 2-hydrate	granules chem. pure
Lohtragon® E36	16	Ferric Nitrate 9-hydrate	crystals chem. pure
Lohtragon® V04	131	Ferrous Sulfate 7-hydrate	crystals chem. pure
Lohtragon® V05	273	Ferrous Sulfate, dried	powder chem. pure
Lohtragon® V01	703	Ferrous Sulfate Solution	solution approx. 50 %
Lohtragon® V26	11	Ferrous Ammonium Sulfate 6-hydrate	crystals chem. pure
Lohtragon® V28	23	Ferric Sulfate	powder chem. pure
Magnesium			
Lohtragon® C35	145	Magnesium Hydroxide	powder chem. pure
Lohtragon® C36	735	Magnesium Carbonate	powder chem. pure
Lohtragon® C46	353	Magnesium Oxide	powder chem. pure
Lohtragon® K19	47	Magnesium Acetate 4-hydrate	crystals chem. pure optimized flowability
Lohtragon® K92	10	Magnesium Acetate, anhydrous	powder chem. pure
Lohtragon® O41	18	Magnesium Nitrate 6-hydrate	crystals chem. pure
Lohtragon® O73	19	Magnesium Peroxide	powder chem. pure
Lohtragon® V15	101	Magnesium Sulfate, dried	powder chem. pure
Manganese			
Lohtragon® O03	35	Manganese(II) Acetate 4-hydrate	crystals chem. pure



Product	Type	Used substance	Product description*
Potassium			
Lohtragon® B40	105	Tripotassium Citrate 1-hydrate	crystals chem. pure
Lohtragon® B60	11	Dipotassium Tartrate 0.5-hydrate	crystals chem. pure
Lohtragon® B61	28	Potassium Sodium Tartrate 4-hydrate	crystals chem. pure
Lohtragon® B71	11	Potassium Formate	crystals chem. pure
Lohtragon® O02	90	Potassium Acetate, anhydrous	powder purity acc. to E 261
Lohtragon® O16	19	Dipotassium Oxalate 1-hydrate	crystals chem. pure
Sodium			
Lohtragon® B09	140	Trisodium Citrate 2-hydrate	fine powder chem. pure optimized flowability
Lohtragon® B15	68	Monosodium Citrate, anhydrous	crystalline powder chem. pure
Lohtragon® B44	43	Sodium Benzoate	fine powder purity acc. to E 211
Lohtragon® B45	23	Sodium Succinate 6-hydrate	crystals chem. pure
Lohtragon® B67	29	Sodium Formate	crystalline powder chem. pure
Lohtragon® E11	59	Sodium Carbonate, anhydrous	crystalline powder purity acc. to E 500(i)
Lohtragon® K18	83	Sodium Acetate, anhydrous	powder chem. pure
Lohtragon® L44	17	Sodium Glycerophosphate Solution	solution approx. 75 %
Lohtragon® V17	69	Sodium Sulfate, anhydrous	powder purity acc. to E 514(i)
Zinc			
Lohtragon® O08	18	Zinc Hydroxide Carbonate	powder chem. pure
Lohtragon® O56	2	Zinc Acetate, anhydrous	powder chem. pure
Lohtragon® O59	132	Zinc Sulfate 1-hydrate	powder chem. pure
Lohtragon® O74	11	Zinc Peroxide	powder chem. pure
Lohtragon® O79	8	Zinc Pyrophosphate	powder chem. pure
Mixture			
Lohtragon® L90	20	Retarder for Construction Chemicals	powder chem. pure
Lohtragon® L90	21	Accelerator for Construction Chemicals	powder chem. pure
Lohtragon® L90	22	Accelerator for Construction Chemicals	powder chem. pure
Lohtragon® L90	23	Accelerator for Construction Chemicals	powder chem. pure
Lohtragon® L90	24	Accelerator for Construction Chemicals	powder chem. pure

*E No qualities refer to European Food Legislation (Commission Regulation EU No 231/2012). For chemically pure qualities, please contact us for your food contact requirement.

Get full access to our
Lohtragon® product information:

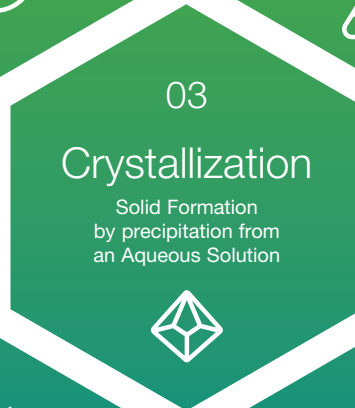


The Lohtragon[®] Manufacturing Process

Only trusted and qualified suppliers and starting materials are used in our manufacturing process.



The Dr. Paul Lohmann[®] water quality is a key contributor to the purity of the final products. Private wells, uncompromising quality control and in-house water treatment stations are the basis.



These manufacturing steps are combined and repeated throughout the production process in order to ensure highest quality standards. All steps are monitored by in-process controls.



During the complex manufacturing process various purification steps further improve the product quality in order to meet the respective specifications.



Meticulous finishing steps ensure consistent high quality materials.

Control is one key parameter during the process. It starts with the raw materials continued after each step and ends with the final products. The quality assurance of your product is covered by sophisticated quality systems.





Your Benefit

- ◆ Specially controlled and pure product qualities
- ◆ Reproducible product properties
- ◆ Batch-to-batch consistency

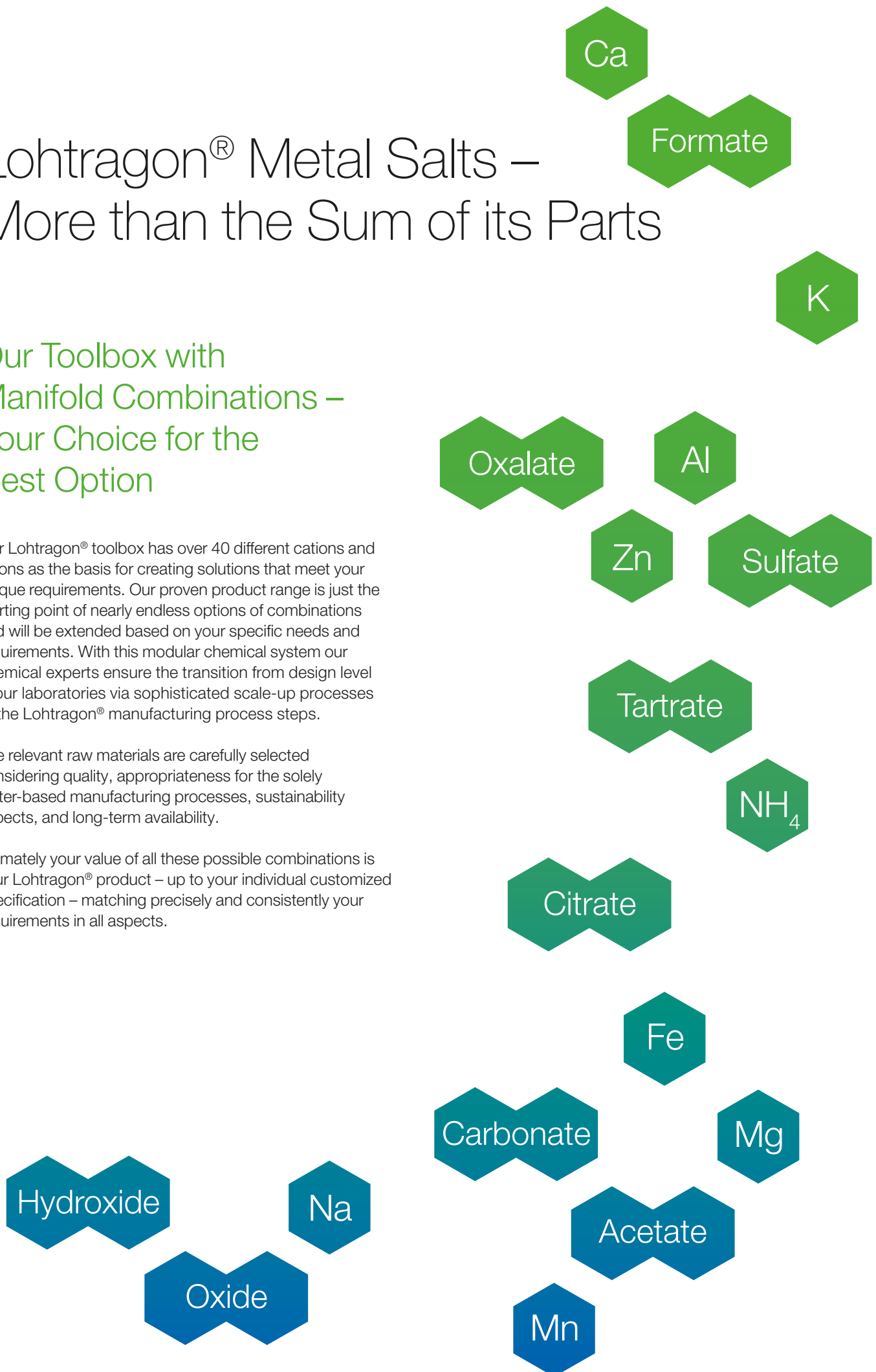
Lohtragon[®] Metal Salts – More than the Sum of its Parts

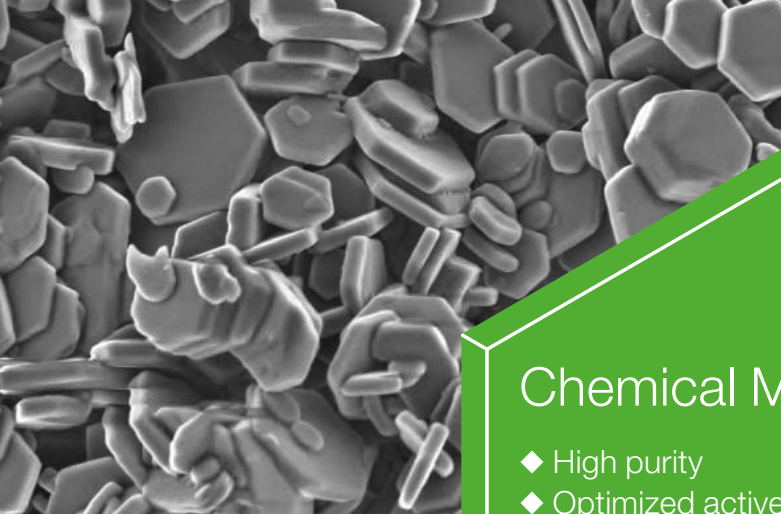
Our Toolbox with Manifold Combinations – Your Choice for the Best Option

Our Lohtragon[®] toolbox has over 40 different cations and anions as the basis for creating solutions that meet your unique requirements. Our proven product range is just the starting point of nearly endless options of combinations and will be extended based on your specific needs and requirements. With this modular chemical system our chemical experts ensure the transition from design level in our laboratories via sophisticated scale-up processes to the Lohtragon[®] manufacturing process steps.

The relevant raw materials are carefully selected considering quality, appropriateness for the solely water-based manufacturing processes, sustainability aspects, and long-term availability.

Ultimately your value of all these possible combinations is your Lohtragon[®] product – up to your individual customized specification – matching precisely and consistently your requirements in all aspects.





Chemical Modification

- ◆ High purity
- ◆ Optimized active content
- ◆ Variation of pH-value
- ◆ Improved solubility behavior
- ◆ Heavy metal characterization
- ◆ Reduced hygroscopy

Chemical Lohtragon[®] Competences

The Art of Chemical Modification

The variation of chemical compositions offers extensive opportunities. In this way, tailor-made metal salts can be synthesized meeting your specific need. Various case studies demonstrate the benefit of these Lohtragon[®] competences for our customers.

Active Content

Many processes and chemical reactions require the highest possible share of an active component as this leads to a maximized efficiency and yield increase. With our chemical toolbox we customize metal salts around your active cation or anion for example in catalytic systems.

pH Variation

With the art of chemical modification we shift the proportional ratio of the cations and anions in order to customize important properties. Providing products with the same qualitative composition varying from the acidic to the neutral pH range is important for the solubility behavior, decomposition temperature and crystal structure.

Crystal Structure

Visualizing and analyzing the crystal structure with our SEM images (Scanning Electron Microscope) is a crucial fundament for the optimization of Lohtragon[®] metal salts and our design of experiments. This is one pillar to assess if our chemical modifications are heading to our mutual goal. The modification of the crystal morphology influences an extensive range of properties.

Solubility

High dissolution rates are mandatory for efficient aqueous processes. For formulators of aqueous recipes, the long-term stability is crucial for a good shelf life. Optimized solubility behavior is important for an extended service life. In both cases the Lohtragon[®] range offers established products to solve your challenge.

Get more information
about our chemical
Lohtragon[®] competences:



Physical Lohtragon® Competences

Designing Particles – Matching Your Target

The Lohtragon® manufacturing process determines the particle characteristics. The particle design and physical properties define highly important features of the Lohtragon® solids. These features can be modified and adjusted to meet required product properties and quality standards. Fascinating and at the same time leading to valuable product performances: worth to showcase a few Lohtragon® particle design features.

Surface Structure

Images of surface structures performed by our Scanning Electron Microscope (SEM) support to find the most suitable products. E.g. the Lohtragon® construction chemicals acting as retarders additionally improve mechanical properties and solidness. Knowing morphological differences is important to efficiently choose suitable metal salts for your application.

Flowability

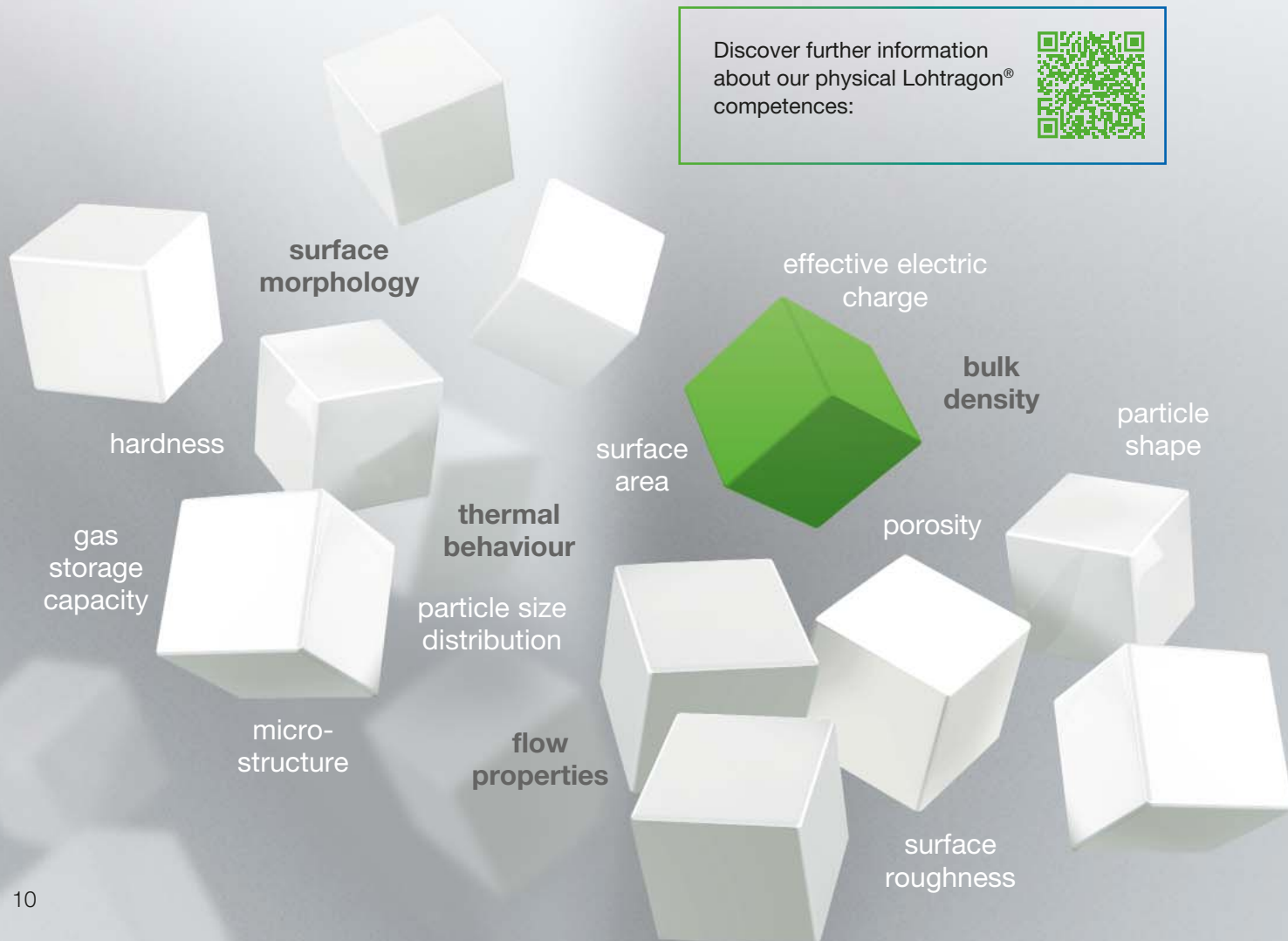
Free-flowing and dust-free: important for powder processing and for health and safety reasons. Lohtragon® free-flowing additives are tested and developed by using various powder cohesion measurement equipments. Physical modification such as granulation is a potential manufacturing process to reduce the dustiness and to increase the flowability.

Thermal Behaviour

Analyzing thermal characteristics is important for the Lohtragon® range used as blowing agents (polymer additives) but not limited to this application. The Thermogravimetric Analysis (TGA) graphs – as exemplified on the next page – are evaluated by our technical experts in order to properly characterize the product and to assess options for further improvements.

Bulk Density

Our bulk density variation competence can be necessary for your product formulation, optimized storage and processing. The Magnesium Carbonate examples around Lohtragon® C36 – as shown on the following page – illustrate our product range with bulk densities from super light (approx. 70 g/l) up to heavy (approx. 500 g/l).





Physical Modification

- ◆ Adapted particle design for your application
- ◆ Target-oriented developments by using state-of-the-art analytical equipment



Our Final Steps – Your Starting Point

d50=2µm



Micronization

- ◆ Reducing particle size, achievable down to 2 µm (d50) by milling
- ◆ Optimization of solubility profiles
- ◆ Improved dispersion behavior in suspensions with low sedimentation tendency



Microencapsulation

- ◆ Avoidance of interaction with other products
- ◆ Controlled release of the active core material
- ◆ Optimum flow characteristics



Granulation

- ◆ Enlarging particle sizes by converting fine powders into larger granules
- ◆ Excellent flowability
- ◆ Reduced dust generation
- ◆ Harmonization of particle structure
- ◆ Minimized material agglomeration



Aqueous Solutions

- ◆ Aqueous solutions with option for ready-to-use concentrations
- ◆ High purity water from private wells with no need of additional biocides



Blending

- ◆ Homogeneous mixtures with option for defined mixing ratio, even for very low concentrations
- ◆ Choice of appropriate carrier



Your Certainty: Skilled Scientists and Material Testing

Our team of experts with extensive know-how in material science ensure a consistent high quality Lohtragon® product range meeting industry standards and individual requirements.

Lohtragon® Supports Your Developments

Characterization is relevant for both the design and development of novel products but also for the process development and optimization. By combining our overall understanding of applications with our comprehensive material characterization, we strive for adding value to your goals.

Characterizing Capabilities/Analytical Systems

- ◆ Scanning Electron Microscopy with Energy Dispersive X-ray analyzer (SEM/EDX)
- ◆ Thermogravimetry and Differential Scanning Calorimetry (TGA-DSC, TGA-DSC-IR)
- ◆ Particle size measurement by laser diffraction and photo-optical techniques
- ◆ Powder rheology
- ◆ Surface analysis (BET)
- ◆ Ion Chromatography (IC)
- ◆ High-Performance Liquid Chromatography (HPLC)
- ◆ X-ray Powder Diffraction (XRD)
- ◆ Zeta potential (particle size and surface zeta potential measurement)
- ◆ Elemental analysis (CHNSO)
- ◆ Atomic Absorption Spectroscopy (AAS)
- ◆ Atomic Fluorescence Spectroscopy (AFS)
- ◆ Inductively Coupled Plasma (ICP-OES and ICP-MS)
- ◆ Voltametry
- ◆ Viscosimeter
- ◆ UV VIS spectrophotometer (color measurement)
- ◆ Water activity (a_w) measurement
- ◆ Microwave moisture measurement
- ◆ Kofler bench (microscope with camera)
- ◆ Refractometer
- ◆ Dissolution tester
- ◆ Melting point measurement
- ◆ Tensiometer (surface tension)
- ◆ Microbiological tests
- ◆ Ultrasonic measuring system

Have a deeper look at our analytical equipment and services:



The Sustainable Way – Mutual Responsibilities

Sustainability

- ◆ Long-term, reliable approach
- ◆ Contribution to energy savings
- ◆ Responsible raw material selection
- ◆ Reduced environmental burden

Thinking in Circles...

The Lohtragon® mindset around sustainability includes operational principles for a responsible way of handling resources. We are committed to this journey and strive for constantly thinking in circles – e.g. by selecting raw materials, supporting recycling processes, contributing to renewable energy systems, to name a few.





Lohtragon® – A Brand of Dr. Paul Lohmann®

Dr. Paul Lohmann GmbH & Co. KGaA manufactures the world's broadest portfolio of mineral and metal salts for the use in a variety of applications. In consequence of innovation and highest quality standards we are proud of our tradition of more than 135 years. At the same time we constantly take on responsibility for further improvements to best serve industries like pharmaceutical, biopharma, food, nutritional supplements, feed, cosmetics, and – with Lohtragon® – the industrial applications.

Covered by Dedicated Certifications and Initiatives





Dr. Paul Lohmann® is certified according to DIN EN ISO 9001, DIN EN ISO 50001, FSSC, Sedex, EcoVadis and partner of the Responsible Care Initiative.

Providing Full REACH Service

Especially our Lohtragon® range is concerned by REACH legislation. Our REACH department provides full service for you.

Let's Connect

Connect directly with our dedicated Lohtragon® team:

-  **+49 5155 63-5888**  **contact@lohtragon.com**
-  **<https://www.linkedin.com/company/dr.paullohmann/about>**
-  **www.lohtragon.com**

We care about your enquiries and ensure best possible support in order to provide you a solution for your requirement. Ask for additional information you may need and challenge our technical expertise.

Let's connect via our monthly newsletter – conveniently in your inbox! Stay up-to-date and sign up on our website.

Let's connect – our global presence:



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