THEORETICAL FUNDAMENTALS GRANDER® WATER REVITALIZATION SCIENTIFICALLY PROVEN

GRANDER®
WATER

#wasserrevolution4.0

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... the universal **power** of **water**.

GRANDER® WATER REVITALIZATION

Today, GRANDER® water revitalization is available all over the world. Over a million people benefit from Johann Grander's invention († 2012) and many can no longer do without GRANDER® revitalized water.

In September 2019, a water symposium was held in Kitzbühel to mark the company's 40th anniversary. Internationally renowned scientists from all over the world took part with speeches about the element Water; fascinating the audience.

Under the title "#wasserrevolution4.0", new developments and findings were presented that demonstrate a change in water research.

The results and findings on the effectiveness of GRANDER® revitalized water are preceded by thousands of positive experiences from customers and users all over the world on daily basis.

1979 Foundation of IFAM GmbH company

1986 Discovery of water revitalization by Johann Grander

1989 Purchase of the former copper mine from which the Stephanie spring originates.

1992 Construction of the new company building

1993 First contacts in China

1996 GRANDER® registered as a trademark

1997, 1998 Expansion of the company building

2000 Honorary Silver Award of the Russian Academy of Natural Sciences

2001 Honorary Cross for Science and Art of the Republic of Austria

2003 Gift of the Russian Environmental fund – 2,000 years old water

2003 Expansion of company building

2009 Honorary Diploma for Merits and Achievements by the Tyrolean Chamber of Commerce on its 30th anniversary

2012 Johann Grander †

2014 Foundation of "GRANDER Wasserbelebung GmbH"

2016 Foundation of "GRANDER Export GmbH"

2017 Foundation of "GRANDER Italia"

2019 Ingeborg Grander †

Scientific proof of GRANDER® water revitalization's theoretical principles

Honorary diploma (40th anniversary) by the Chamber of Commerce

Honour (traditional companies) by the province of Tyrol

GRANDER®
WASSER

SCIENTIFICALLY PROVEN EFFECT

Ever since GRANDER® water revitalization has existed, we have had two perplexing questions that can now be scientifically answered:

HOW DOES GRANDER® WATER REVITALIZATION WORK?

and

CAN THE GRANDER® EFFECTS BE SCIENTIFICALLY PROVEN?

For decades, satisfied users have described and documented their positive experiences with GRANDER® – preceding the scientific explanation that led to an important step forward:

The "revolutionary" water results and the evidence from **newly emerging scientific branches of science such as applied water physics[2] and improved water analysis methods[3],** have all helped to understand the basic mechanisms and individual factors to test, confirm and replicate in laboratory experiments GRANDER® water revitalization.

Applied Water Physics

Applied Water Physics focuses on the research of the fundamental properties of water, especially its interactions with electric, magnetic and electromagnetic fields and how such interactions affect living organisms such as bacteria.

Over the past 40 years, extensive research has been conducted on the effects of magnetic or electromagnetic treatment on water – with over a hundred articles and reports available in the literature.[10–29]

Allegations that the influence of a magnetic field on hard water influences the structure and morphology of calcium carbonate crystallization have long been viewed with skepticism by the scientific community. This was mainly due to the fact that there was no feasible mechanism that could explain the permanent effect of magnetic fields even after the end of exposure.

As a result, its use was controversial among experts, not only with regard to GRANDER® water revitalization.

WETSUS – European Centre of Excellence for Sustainable Water Technology

The multidisciplinary scientific collaboration of European universities and research institutes[3] in the European Centre of Excellence for Sustainable Water Technology – WETSUS – has enabled a breakthrough in the understanding of magnetic water treatment (MWT) from a Water Physics perspective.[4]

Summary of the scientific results:

The scientific results of Dr. Elmar Fuchs[5] and his team at WETSUS[6] "Strong Gradients in Weak Magnetic Fields Induce DOLLOP Formation in Tap Water" could be confirmed in a scientific peer review procedure.[7]

In 2012, Coey published a theory about the mechanism of magnetic water treatment based on the gradient of the applied field and not on its absolute strength.

The WETSUS Applied Water Physics research group's new scientific work is based on the finding that calcium carbonate nanoparticles ("DOLLOPs") – contained in tap water – adopt a new structure if certain conditions (which are, inter alia, caused by magnetic gradients) are met, as a result of which the environmental conditions for dissolved substances (e.g. lime) change.[8]

The results of the study reveal an increased formation of nanometer-sized pre-nucleation clusters (such as dynamically ordered liquid-like oxyanion polymers, "DOLLOPs"). This is consistent with Coey's theory, which consequently can also be applied to very weak magnetic fields as long as they contain strong gradients.

HIGH-RESOLUTION WATER ANALYSIS

Advanced research methods open up new opportunities in modern water analysis. Using **trace analysis**, for instance, even tiny concentrations of materials or substances can be detected.

If you take Lake Achen in Tyrol, Austria (area 6.8 km^2, length 9.4 km, width 1 km, maximum depth 133 m, volume 0.481 km^3 or 481,000,000 m^3), and dissolve a (4 g) sugar cube in it, this new advanced measuring technique would still detect the sugar molecules in this vast body of water.

New Cutting-Edge Microbiological analyses determine the number of bacteria in water in less than an hour. With "traditional methods" it takes 72 hours to determine the total bacterial count in drinking water, and only about 1% of the bacteria actually present are detected, whereas the remaining 99% remain undetected.

In **flow cytometry**, the flow cytometer detects 99% of all bacteria in water and can accurately distinguish between living and dead cells.

Analysis time: < 1 Hour[11]

With this method, cells that individually pass laser beams at high speed can be analyzed. The laser beams trigger fluorescence in the cells, which have been colored in preparation for this analysis. The signals created in this way are measured and counted. Based on the coloring agent used, cell activity can be measured.

SCIENTIFIC PUBLICATION

The scientific, peer-reviewed paper proves the difference between treated/revitalized and regular/unrevitalized water.[1]

"Strong Gradients in Weak Magnetic Fields Induce DOLLOP Formation in Tap Water"

Martina Sammer (1), Cees Kamp (2), Astrid H. Paulitsch-Fuchs (1), Adam D. Wexler (1), Cees J. N. Buisman (1) and Elmar C. Fuchs (1),(*)

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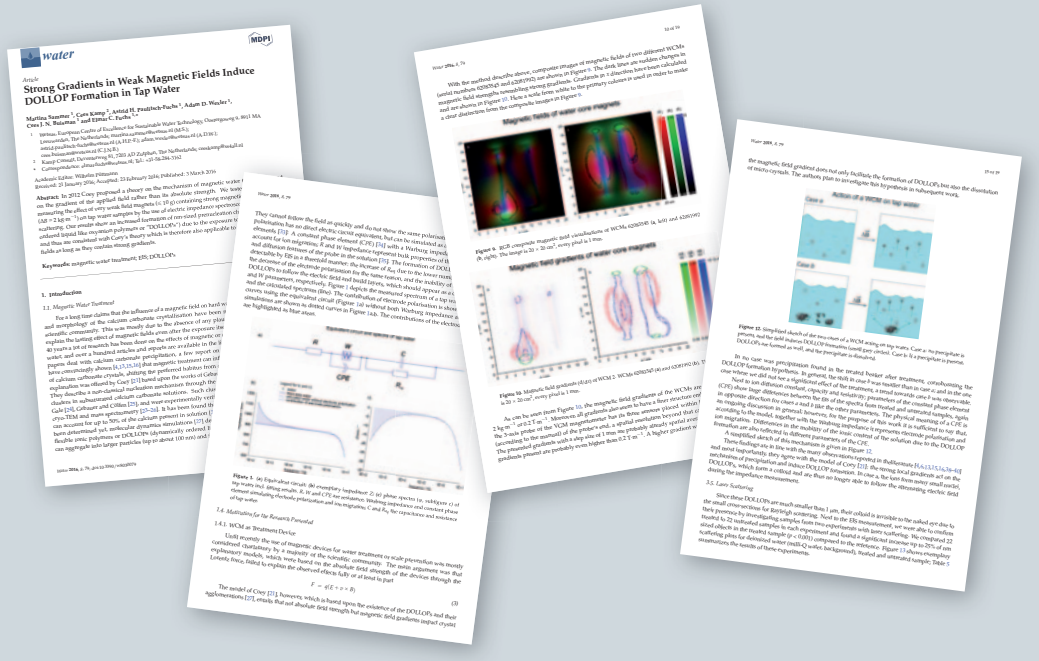


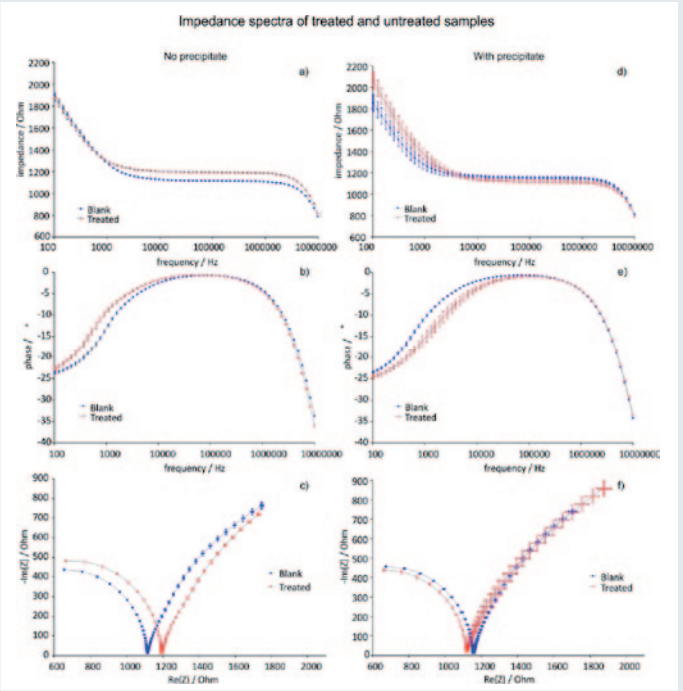
The analysis of revitalized and non-revitalized water shows the following result:

1. TREATMENT/REVITALIZATION CAUSES A CHANGE IN ELECTRICAL RESISTANCE OF THE ALTERNATING CURRENT (IMPEDANCE) IN THE WATER

2. TREATMENT/REVITALIZATION LEADS TO AN INCREASED FORMATION OF LIME NANOPARTICLES IN WATER, SO-CALLED DOLLOPS

Depending on the frequency, there are **significant** differences between treated/revitalized and regular/unrevitalized water.

Note: the presented DOLLOP formation has been tested in at least 16 independent experiments;
12 measurements per experiment,
one measurement covers the impedance and the phase per frequency for 65 frequencies.[8]



Graphic: IPF/GRANDER® related to DOLLOP-research (see source references)

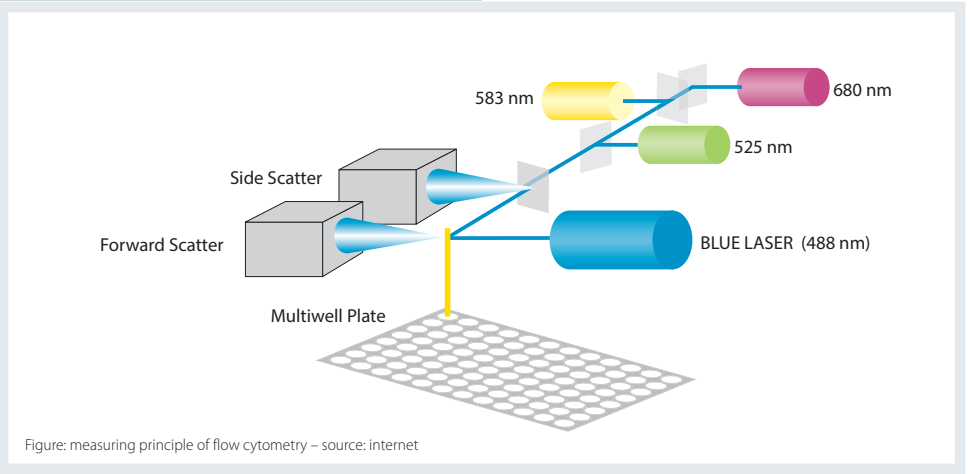


Figure: measuring principle of flow cytometry – source: internet

The effects of treatment/revitalization have been detected using three different analytical methods:

a) Impedance spectroscopy

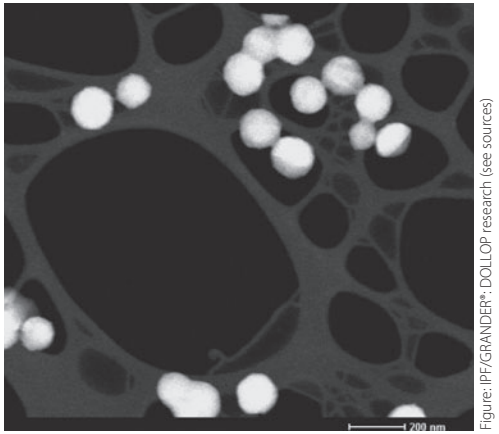
In this method, alternating current is introduced into a measuring cell filled with the water to be analyzed. The frequency of the alternating current is varied, the electrical alternating current resistance (impedance) as well as the phase shift of the sample are determined.

b) Laser scattering

The number of nano-particles (DOLLOPs) is measured using a flow cytometer.[8]

c) Scanning electron microscope

After treatment with GRANDER® water revitalization, increased DOLLOP formation is observed. DOLLOPs can act as crystallization nuclei for lime (calcium carbonate) crystal formation and influence lime-scale deposition behaviour.[8][9]



DOLLOPS – CaCO3-Nanoparticles

Figure: IPF/GRANDER®: DOLLOP research (see sources)

GRANDER® EFFECTS MADE UNDER-STANDABLE

a) Modified deposition behaviour

If dissolved lime crystallizes on the pipe walls, this leads to an undesirable reduction in the pipe cross-section and increases flow resistance. Besides, the rough "lime surface" may provide improved growth conditions for undesirable bacteria and biofilm.

Without revitalization: fewer DOLLOPs
Dissolved lime crystallizes on the pipe walls and reduces the cross-section.[9]

With revitalization: many DOLLOPs
Dissolved lime crystallizes through the DOLLOPs in the water and is washed out.[9]

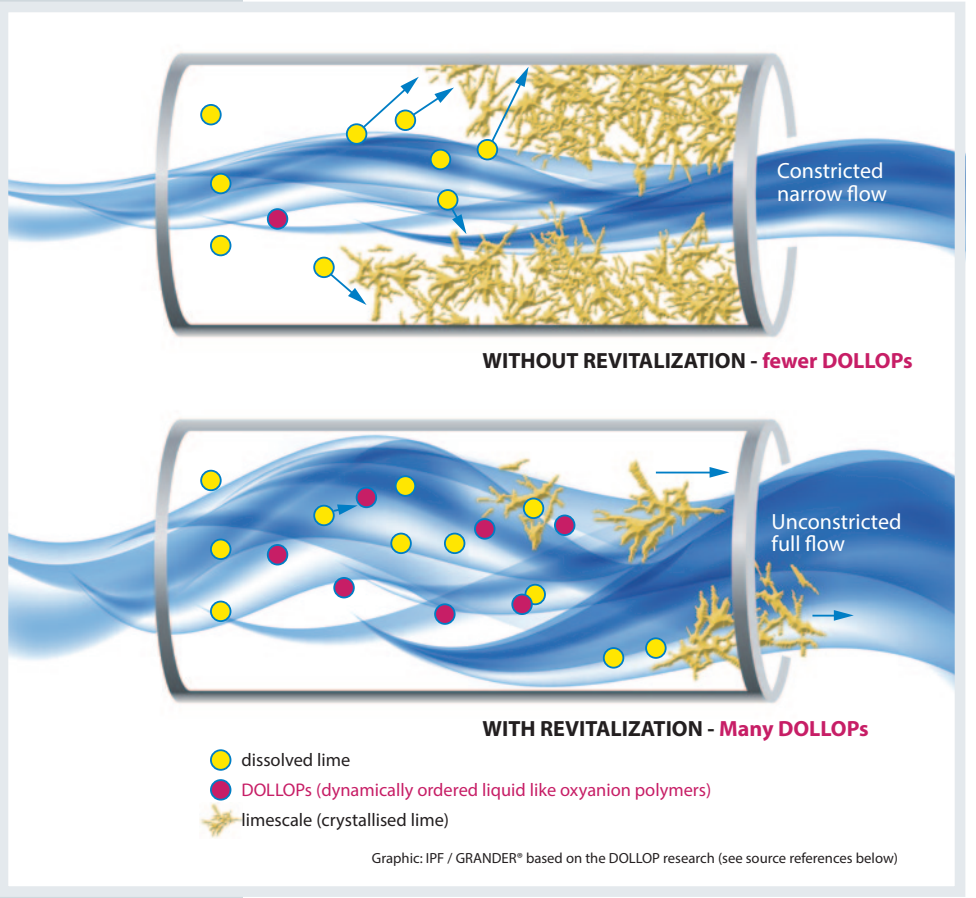
When DOLLOPs are highly concentrated in water, crystallization starts immediately in the water and very slightly on the pipe walls. So these crystals no longer adhere to the pipe but are washed out with the water stream.[8]

b) Enhanced self-cleaning power

The background flora of a water (indigenous bacteria) act like an immune system. It naturally protects water from unwanted bacteria by consuming nutrients through its own activity, thus providing less livelihood for unwanted bacteria or germs.

Simultaneously, there is a biological predatory competition in which the healthy flora eventually assert themselves.

It should, of course, be emphasized that if the "dirt load" into the system becomes too high, GRANDER® must be combined with conventional treatment methods to reduce the "dirt load" and achieve the desired effect.



Graphic: IPF / GRANDER® based on the DOLLOP research (see source references below)

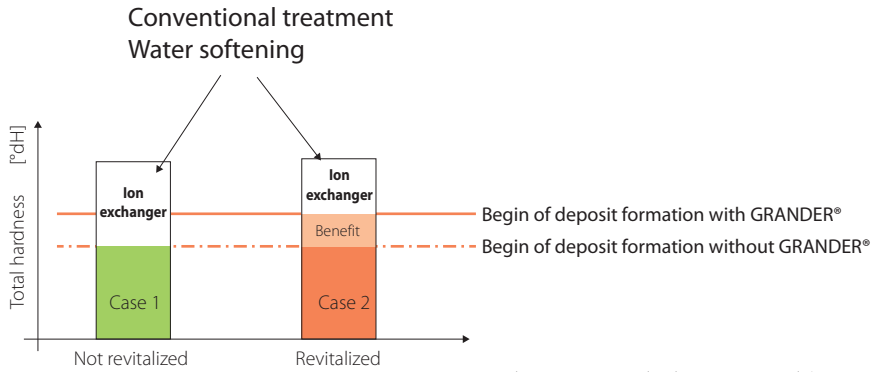
What is influenced by the increased self-cleaning power of water?

- **> Durability is prolonged**
- **> Post-pollution potential drops**
- **> Microbiological stability increases**
- **> Resistance of the water increases**

Through the flow cytometry method, it can be shown that GRANDER® water revitalization strengthens the natural background flora and thus improves the resistance.

BENEFITS OF GRANDER® EFFECTS:

Example: Depositing tendency:



Graphic: IPF/GRANDER® related to DOLLOP research (see source reference)

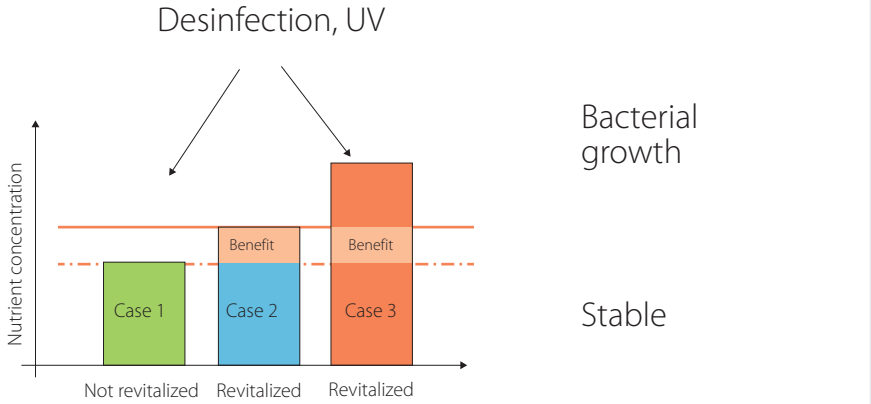
Water has the ability to dissolve lime. pH value and temperature are essential parameters. Saturation with other minerals and substances also determines the amount of lime that remains dissolved in the water and when it begins to crystallize.

In revitalized water, deposits only begin to form after a higher degree of hardness than in unrevitalized water is attained. For very hard water and unfavourable conditions, a combination with conventional treatment (ion exchanger) is recommended if you do not want any lime-scale deposits.

BENEFITS OF WATER REVITALIZATION IN TERMS OF DEPOSITS

- **> Revitalized water tolerates a higher degree of hardness without forming deposits**
- **> When combined with an ion exchanger, the residual hardness can be set to a higher value.**
- **> Saves costs for chemicals, electricity and maintenance**
- **> Water has a better taste**

Example microbiological stability:



Graphic: IPF/GRANDER® related to DOLLOP research (see source reference)

Bacteria need nutrients and an appropriate environment to stay in the water and multiply.

In revitalized water, the natural background flora is more active and consumes more nutrients, so undesirable bacteria can not establish themselves easily.

However, if the dirt load is very high, a combination with conventional (sediment &/or carbon) filter treatment methods is recommended.

BENEFITS OF WATER REVITALIZATION IN TERMS OF MICROBIOLOGICAL STABILITY

- **> Higher microbiological stability**
- **> Revitalized water remains stable even with higher nutrient content**
- **> Saves costs for chemicals, electricity and maintenance[9]**

VISIONS FOR A SUSTAINABLE FUTURE

The use of the natural powers of revitalized water is an important step towards achieving sustainability and health.

The stronger and more natural the water, the less treatment is required. This saves resources, protects our environment and helps to save costs.

Our philosophy is to strengthen the positive powers of water and bring it back into natural balance.

"WE DON'T SEE THE SMALL NOR UNDERSTAND THE BIG."

Johann Grander

Modern measurement technology has finally enabled us to see at least a part of the small! Johann Grander was decades ahead of us with his knowledge.

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