

CWSR- Revolutionary
CERAMICS WATER SCALE REMOVING
Scale Prevention Media

- NSF 61 Certified
- No Chemicals
- No Regeneration
- No Back wash
- No Valve
- No Electricitv

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Introduction

CWSR is the result of extensive research work along with its undisputable success in the market, worldwide since 2005.

the core motivation for developing this product was to find an alternative to conventional ion exchange based water softeners, reverse osmosis or other chemical based systems that prevent scale.

Recent restrictions placed upon the above mentioned technology lead to an environment friendly, cost effective solution for hard water, CWSR.

Description of **CWSR** Scale Prevention:

CWSR completely takes care of the primary cause of scale forming cations viz. Ca^{2+} and Mg^{2+} .

Working Principle:

When the hard water under goes nucleation in the pressure vessel, the calcium bicarbonate $\text{Ca}(\text{HCO}_3)_2$ is transformed into aragonite form of calcium carbonate CaCO_3 crystals. These crystals are formed through decomposition and crystallization process, forming very stable harmless crystals.

The following equation describes the reaction that occurs inside the pressure vessel when flow over grains of nucleation.



indicate this unique transformation of water hardness $\text{Ca}(\text{HCO}_3)_2$ into **3** components viz. **1.** CaCO_3 (micro-crystals) **2.** CO_2 (colloid) and **3.** H_2O (pure)

In the pressure vessel, the equilibrium of carbonate species in water is changed, assisted by the driving force of stable crystal formation and therefore the reaction is pushed to the right \rightarrow . With this technology, as long as CO_2 is being removed the soluble $\text{Ca}(\text{HCO}_3)_2$ converts into insoluble calcium carbonate (CaCO_3) crystals.

The calcium carbonate crystals grow steadily. They are **very stable** and **cannot dissolve** (incapable of forming scale) in the water.

Glass grains crystallization sites provide **increased nucleation sites** for the formation of submicron sized CaCO_3 crystals. Hence this amazing process is called **Nucleation Assisted Crystallization** or **(NAC)** in short.

Nucleation Assisted Crystallization (NAC)

Once formed and detached from the surface of **CWSR** media beads, the crystals will not adhere to any other surfaces, even in the case of hot water applications. The crystals cannot form scale because of its stable molecular structure and neutral surface electro potentiality.

NAC is the basis of reliable **Scale Prevention** capability of **CWSR**.

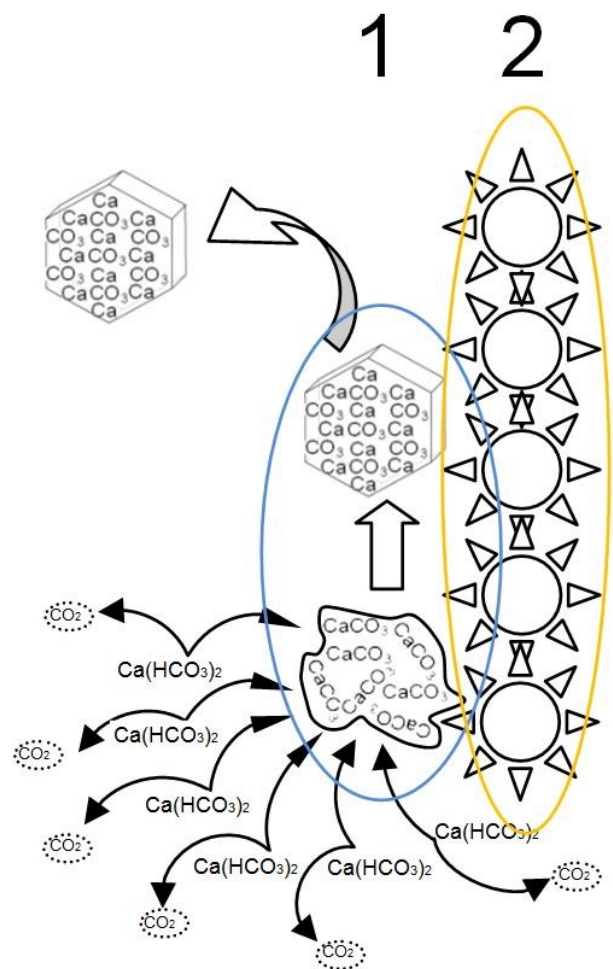
The transformation of water hardness takes place in the following steps:

1. Continuous transformation of water hardness makes immediate crystal growth possible with unidirectional chemical equilibrium viz. $\text{Ca}(\text{HCO}_3)_2 \rightarrow \text{CaCO}_3 + \text{CO}_2 + \text{H}_2\text{O}$
As CO_2 leaves quickly, the right hand direction of the equation is preserved.
2. The crystals developing on the surface of the **CWSR** bead grow rapidly and nucleate using the formed CO_2 micro-bubbles (colloid gas) as the template.
3. After a certain period of time the micro-emulsion of CO_2 & CaCO_3 forms hollow particles & leaves the media bead surface in neutral form. The average dimension of CaCO_3 crystal coated globules ranges in micro-meter. The noted reaction time is normally less than 4 seconds.

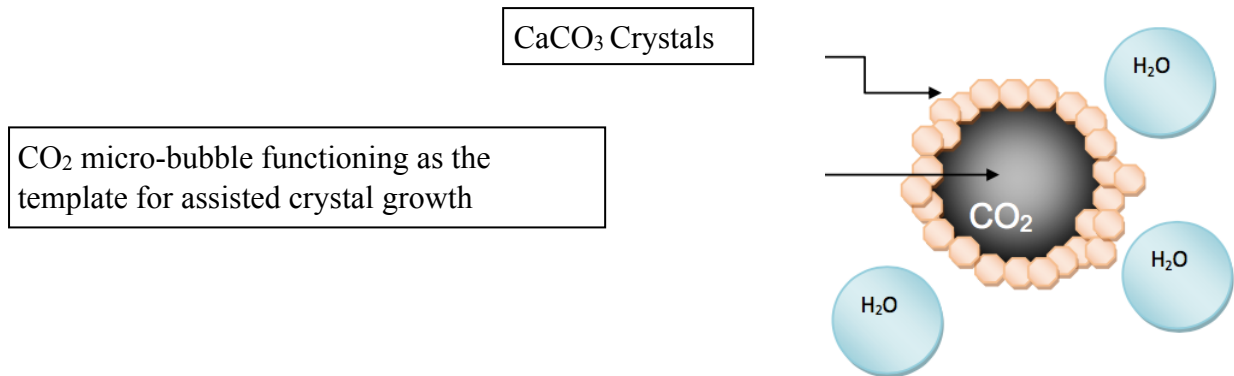
By definition, a catalyst speeds up a process by lowering the activation energy barrier required for the transformation of the reactants or their meta-stable intermediates into the product.

The calcium and magnesium bicarbonates from water are forming meta-stable amorphous carbonate particles, by liberating CO_2 . This process is reversible since the stability of the amorphous particles is low, and therefore these particles re-dissolve and have a relative short lifetime.

However, once the amorphous particles reach the catalytic surface of **CWSR (2)** they undergo transformation into carbonate crystals **(1)**. Since the crystals are more stable compared with amorphous particles, the process is not reversible and crystals leave the **CWSR** surface.



CWSR formed crystals can sustain a temperature up to 380°C, before structural breakdown to calcite form. This property of the transformed hardness makes the treated water perfect for hot water applications and boilers.



During the flow some of the micro-bubbles are losing a small amount of CO₂, which diffuses rapidly in water and interact with surface scale, especially in closed spaces (pipes, boilers, etc). As a result, the scale which is already present on these surfaces is removed slowly.

Micro Crystals and Colloid CO₂...

The story behind pH stabilization of **CWSR** treated water

Influence of formed CaCO₃ as pH balancing factor:

- The reaction: $\text{Ca}(\text{HCO}_3)_2 \rightarrow \text{CaCO}_3 + \text{CO}_2 + \text{H}_2\text{O}$ is unidirectional while **CWSR** is transforming the hardness into water insoluble crystals.
- In the nucleation assisted crystallization process, formed CO₂ stays as **colloid gas** and interacts rapidly with crystals growing in the nucleation site.
- This emulsion of CaCO₃ micro-crystals & CO₂ micro-bubbles forms hollow particles
- Formed hollow particles have both internal and external faces belonging to the aragonites which separate the surrounding water from the enclosed gas cavity.
- Hence, the reverse reaction of CO₂ with water forming Carbonic Acid is not possible and the **pH stability is maintained**. In fact every excess CaCO₃ crystals are buffering any carbonic acid left over.

Why we consider **CWSR** to be the **BEST**?

- **No TDS change;** as **CWSR** does not remove or add anything to the water. As no ion-exchange chemistry is used, the **TDS** of the water remains unchanged before and after the treatment.
- **No pH change:** The **pH** value of the water remains the same. This factor makes the treated water suitable for almost any use where corrosion is concerned. **PhACT™** - pH Advanced Crystallization Technology
- **Minerals Preserved:** **CWSR** does not add sodium or any chemicals to the water. It simply preserves the Calcium and Magnesium contents of water, making the treated water arguably the healthiest mineral water available. Both Calcium and Magnesium are quintessential for nervous systems & muscles functionalities. They are indispensable parts in the cell chemistry of the plants and most of the life forms on earth.
- **De-Scaling:** Not only does **CWSR water** prevent scale formation, but it also helps to remove the previously formed scale by crystal abrasion during the flow of water. Additionally, during flow, some of the micro-bubbles lose a small amount of CO₂, which diffuses rapidly in water, and interact with surface scale, especially in closed spaces (pipes, boilers, etc). As a result, the scale which is already present on these surfaces is gradually removed.
- **Biocides:** The **NAC** process creates the conditions that water dissolved CO₂ agglomerate to form micro-bubbles. These CO₂ bubbles actively destroy bacterial membranes acting as a biocide. So along with the scale prevention **CWSR** also helps prevent Biofouling.

Advantages of **CWSR** :

- Environmentally friendly.
- No back-washing required.
- No power supply (electricity) required.
 - No chemicals added to the water.
- Removes the previous scales of plumbing.
- Catalytic process converts **Ca** and **Mg** into harmless micro crystals.
 - Maintenance free. No extra cost incurred.
 - No chemicals required for disinfection
 - No drain connections required.
 - No control valves required.
 - Very easy to install.

Technical Data:

Characteristics	
Appearance	White granules
Composition	Ceramic modified polymer
Bulk weight (kg/l)	0.80
Particle size (mm)	0.55 - 0.75
Change in volume	up to 60%
Moisture content	10-25%

Operational parameters & water impurities	
Operating temperature (°C)	3 to 90
pH range	6.5 to 9.5
Hardness, max. ppm	1400
Salinity, max. ppm	35000
Iron, max. ppm	0.5*
Manganese, max. ppm	0.05
Free chlorine, max. ppm	3
Copper, max. ppm	1.3
Oil	free
Hydrogen sulphide	free
Phosphates	free

**CWSR is also able to remove Iron from water with very high efficiency. For further details please contact us.*

Lifespan of the Media:

The effective average lifespan of CWSR is 3 to 5 years, depending on the water conditions.

Applications:

Home appliances: Faucets, water pipes, shower heads, toilets. All beverage systems, dish washers, ice makers/cubers, compact washer/dryers.

Major appliances: Central heating, air conditioners, water heaters, air humidifiers, coffee and tea makers, solar heating systems, water coolers.

Boilers: Hot water boilers, central heating boilers, combination boilers, catering water boilers, pool heaters, commercial water heaters*, industrial hot water boilers*.

Cooling towers: Closed circuit cooling towers, open circuit cooling towers, concrete cooling towers, cross flow cooling towers.

Commercial Applications:

Winery, Car Washing, Dairy Processing, Food & Beverages, Injection Molding, Irrigation, Nurseries, Reverse Osmosis pre-treatment etc.

*with blow down

Practically CWSR systems can be installed anywhere where Scale Prevention is concerned.

Its unique working method (pH stability), cost effective scale prevention & removal, ease of design & installation (simple in & out connections), makes CWSR the ultimate choice for both residential and commercial applications.