

**WEAK ACID CATION SOFTENING  
RAISING AWARENESS OF ACIDS**

# RAW WATER SAMPLE

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- Note the pH, TDS, Chloride and Bicarbonate

|           |           |                 |            |              |               |
|-----------|-----------|-----------------|------------|--------------|---------------|
| Sampled:  | 3/14/2013 | Supply/Source:  | MUNICIPAL  | Condition:   | TREATED WATER |
| Received: | 3/15/2013 | Sampling Point: | PRE CLARIS | Application: | Commercial    |

## ANALYSIS INFORMATION:

|                             |                 |                            |       |
|-----------------------------|-----------------|----------------------------|-------|
| Turbidity(Method 180.1 R 2. | 0.9 NTU         | Turbidity after filtration | N.M.  |
| Conductivity(Method 120.1   | 1268.0 MMHOS/CM | Est. TDS by Conductivity   | 785.7 |
| Color(Method 2120C)         | 3.0             | Color after Acidification  | N.M.  |
| pH(Method 150.1 R 1982)     | 7.8             | Tannins                    | <2    |

Concentrations reported as mg/L (PPM) unless otherwise indicated

### CATIONS (Method 200.7)

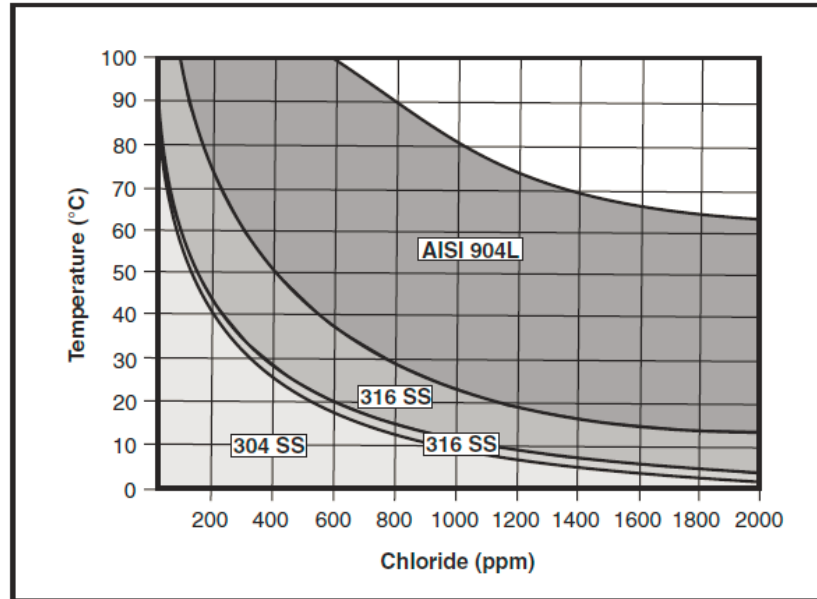
|                | As Element | As CaCo3 |
|----------------|------------|----------|
| Calcium (Ca)   | 132        | 330.0    |
| Magnesium (Mg) | 32.7       | 134.7    |
| Sodium (Na)    | 46.6       | 101.6    |
| Potassium (K)  | 2.1        | 2.7      |
| Strontium (Sr) | 0.29       | 0.4      |
| Barium (Ba)    | 0.9556     |          |
| Iron (Fe)      | <0.05      |          |
| Manganese (Mn) | <0.02      |          |
| Copper (Cu)    | 0.007      |          |
| Zinc (Zn)      | <0.05      |          |

### ANIONS (Method 300.0)

|                    | As Element | As CaCo3 |
|--------------------|------------|----------|
| Chloride (Cl)      | 258        | 363.8    |
| Nitrate As N (NO3) | 2.8        | 10.1     |
| Nitrite As N (NO2) | <0.1       | <0.4     |
| Sulfate (SO4)      | 13         | 13.5     |
| Bicarbonate        | 217.8      | 178.5    |
| Carbonate          | N.M.       | N.M.     |
| Fluoride (F)       | 0.1        | 0.25     |
| Silica (SiO2)      | 24.8       |          |

# CHLORIDE, CORROSION & STAINLESS

**CORROSION DIAGRAM  
AISI 304, 316 AND 904L**

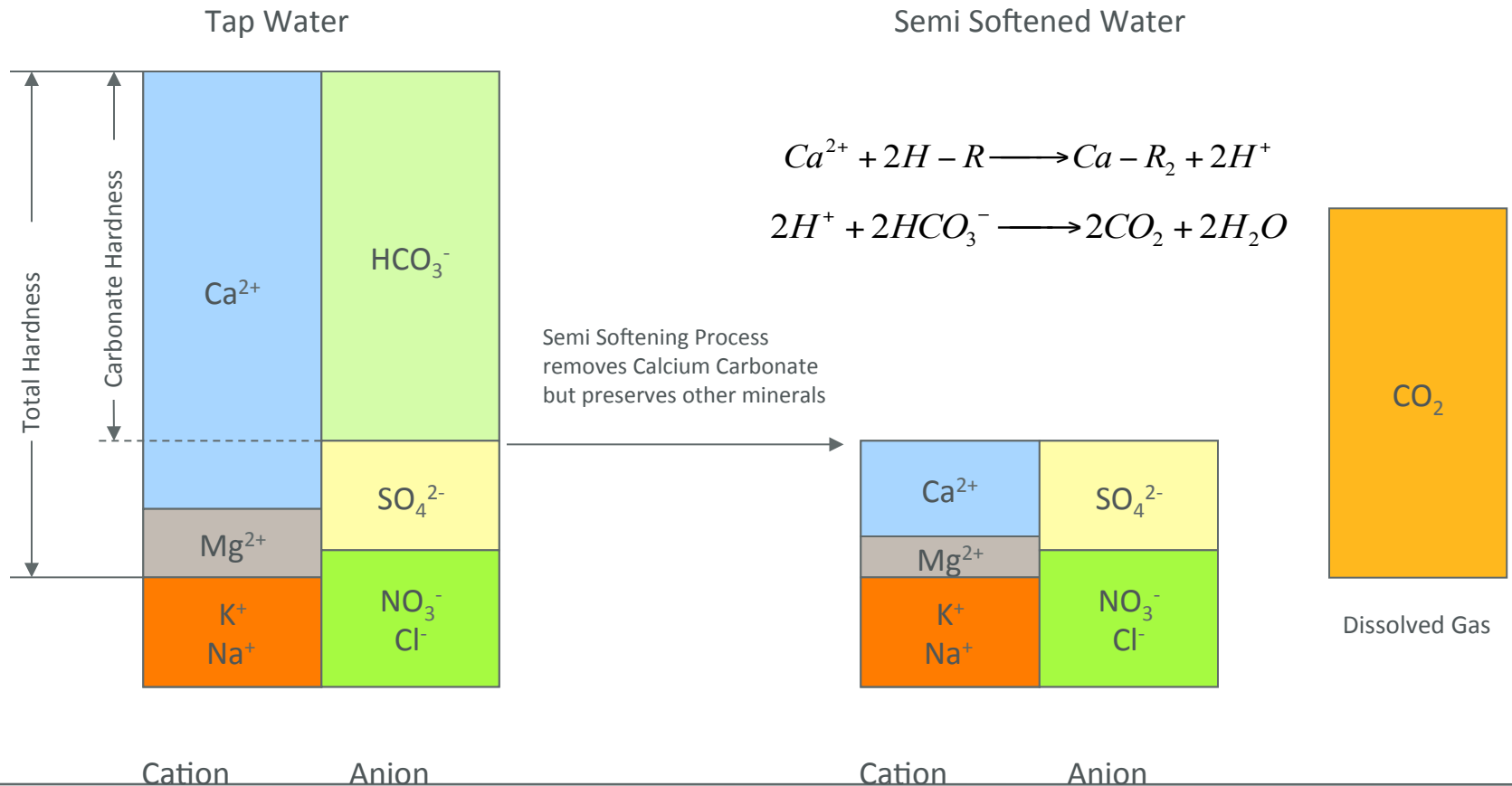


*Figure 1: Drinking water qualities*

- Even at very low concentrations, even 304SS and 316SS can corrode
- Adding temperature (like in a boiler) just increases the problems

# WEAK ACID CATION SOFTENING

## Semi Softening, a neutral removal process of carbonate hardness



# WATER AFTER CLARIS

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## ANALYSIS INFORMATION:

|                             |                |                            |       |
|-----------------------------|----------------|----------------------------|-------|
| Turbidity(Method 180.1 R 2. | 0.2 NTU        | Turbidity after filtration | N.M.  |
| Conductivity(Method 120.1   | 934.0 MMHOS/CM | Est. TDS by Conductivity   | 585.6 |
| Color(Method 2120C)         | 1.8            | Color after Acidification  | N.M.  |
| pH(Method 150.1 R 1982)     | 5.4            | Tannins                    | <2    |

Concentrations reported as mg/L (PPM) unless otherwise indicated

### CATIONS (Method 200.7)

|                | As Element | As CaCo3 |
|----------------|------------|----------|
| Calcium (Ca)   | 68.5       | 171.3    |
| Magnesium (Mg) | 31.3       | 129.0    |
| Sodium (Na)    | 40         | 87.2     |
| Potassium (K)  | 1.9        | 2.4      |
| Strontium (Sr) | 0.21       | 0.3      |
| Barium (Ba)    | 0.1845     |          |
| Iron (Fe)      | <0.05      |          |
| Manganese (Mn) | <0.02      |          |
| Copper (Cu)    | 0.005      |          |
| Zinc (Zn)      | <0.05      |          |

### ANIONS (Method 300.0)

|                    | As Element | As CaCo3 |
|--------------------|------------|----------|
| Chloride (Cl)      | 278        | 392.0    |
| Nitrate As N (NO3) | 2.9        | 10.4     |
| Nitrite As N (NO2) | <0.1       | <0.4     |
| Sulfate (SO4)      | 14         | 14.6     |
| Bicarbonate        | 16.6       | 13.6     |
| Carbonate          | N.M.       | N.M.     |
| Fluoride (F)       | 0.1        | 0.25     |
| Silica (SiO2)      | 25.2       |          |

|                 | Mg/L  | GPG   |                | Mg/L  | GPG   |                  | Mg/L | GPG  |
|-----------------|-------|-------|----------------|-------|-------|------------------|------|------|
| Cations (CaCO3) | 389.8 | 22.80 | Anions (CaCO3) | 430.9 | 25.20 | Hardness (CaCO3) | 300  | 17.6 |

- Bicarbonates – dramatic reduction (217 to 16)
  - TDS – reduction similar to bicarbonate reduction (785 to 585)
  - Chloride maintained levels
  - pH – more acidic (7.8 to 5.4) as acid was created by chloride ions interaction with hydrogen released and removal of bicarbonate buffer.
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# SUMMARY

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- All weak acid cation (WAC) softening products perform with similar chemistry requirements
  - Claris (like other WAC products) is great for water with bicarbonate levels above 100 & low chloride and sulfate levels less than 80ppm and 150ppm respectively.
  - Maintains beneficial minerals for quality coffee
    - Protects equipment from scale formation
  - Water with high acid risk (high chloride and or sulfate levels) should consider reverse osmosis technology for removal.
  
  - Note chloride and sulfate limits are based on the stainless steel industry and not on Espresso equipment manufacturers specifications.
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