



Polyaspartates for the Water Treatment Market



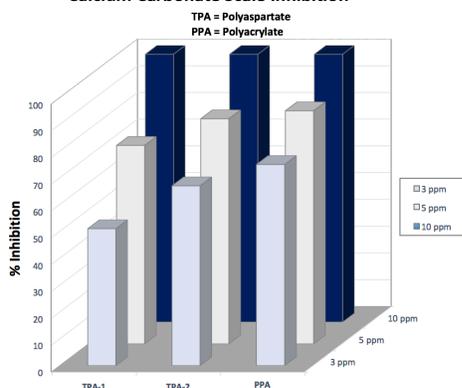
NanoChem Solutions, Inc. (NCS) manufactures proprietary polyaspartates for the water treatment market. With a number of different molecular weights and options (both liquid and dry), NCS has supplied companies in the water treatment market with biodegradable, non-bioaccumulating products and technologies for over 15 years.

Product Description

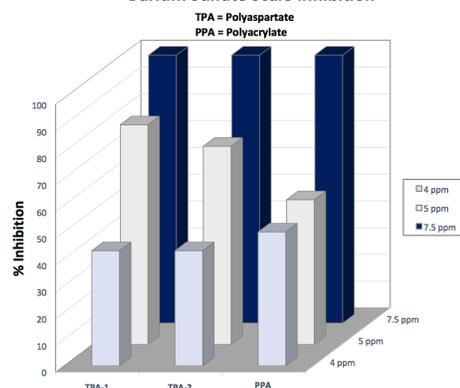
NCS polyaspartates are negatively-charged (anionic), biodegradable amino-acid polymers that are polymerized from L-aspartic acid, an amino acid produced in industrial scale by fermentation. The molecular weight of the polymer can vary depending on the specific application. The polymers are small enough to remain highly water soluble, but large enough to act effectively as biodegradable carbonate- and sulfate-scale inhibitors, while also enhancing the efficacy of corrosion inhibitors.

Calcium Carbonate and Barium Sulfate Scale Inhibition Charts

Calcium Carbonate Scale Inhibition



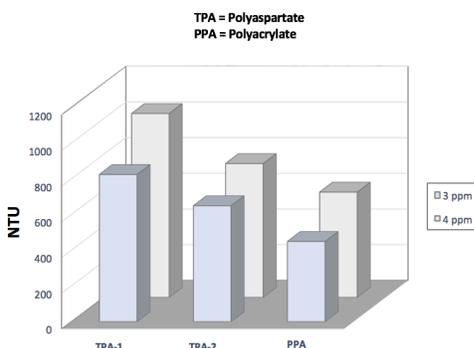
Barium Sulfate Scale Inhibition



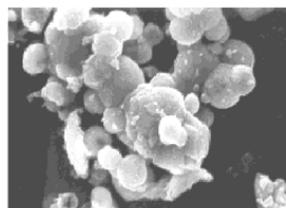
NCS polyaspartates are effective calcium sulfate and barium sulfate scale inhibitors. As the data shows in these charts, at a concentration of 10 ppm, NCS polyaspartates can be as effective as polyacrylates.

Kaolin Dispersion Chart

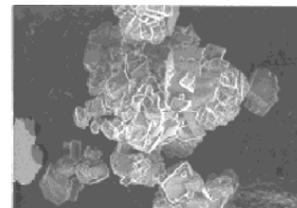
Kaolin Dispersion



NCS polyaspartates can be used to help disperse suspended solids in water solutions.



CaCO₃ Treated With Polyaspartate (Vaterite), 4000x



CaCO₃, no treatment (Calcite), 2000x



Polyaspartates for the Water Treatment Market



Corrosion Inhibition

To demonstrate the performance of NCS's polyaspartate products in regard to corrosion inhibition, NCS DB-105 was applied at 5 ppm in a simulated cooling tower water corrosion test alongside molybdate (MoO_4^{2-}) at 5 ppm to see if NCS DB-105 would be a viable replacement for molybdenum:

Simulated Cooling Water Corrosion Test			
Base Treatment:		Phosphonate Cobratec® TT50S Industry standard polymer	
Additional Application Rate:		5 ppm NCS DB-105 or 5 ppm MoO_4^{2-}	
Water Parameters (in ppm):			
$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$	$\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$	$\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$	NaHCO_3
905.6	32.9	280.0	551.0
Time:		3 days	
Water pH:		8.7	
Flow Rate:		1.0 m/s	
Steel Type:		1010 mild steel	

Corrosion Rate, 1.1 mpy



With 5 ppm MoO_4^{2-}

Corrosion Rate, 1.8 mpy



With 5 ppm NCS DB-105

Conclusions: When comparing the difference between the mild steel treated with the molybdate anion (MoO_4^{2-}) and NCS DB-105, the corrosion rates statistically similar (1.1 mpy compared to 1.8 mpy). Given the cost and negative environmental implications of molybdenum sources, NCS DB-105 should be considered a viable biodegradable, non-bioaccumulating alternative input in a water treatment program with other industry-standard inputs.