

A Highly-Effective Aluminum-Staining Inhibitor **ColaCor 900**

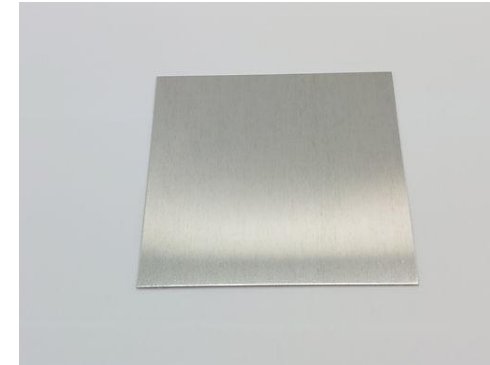
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Aluminum Staining

- Generally, refers to
 - The discoloration
 - Appearance of spots, blotches, or residue
- Leading Causes
 - Chemical reactions
 - Water stains
 - Galvanic corrosion



Pathways for Aluminum Staining Prevention

- **Formation of physical barriers**
 - A protective film deposited on the aluminum surface to protect it from staining
- **Complex formation**
 - Inhibitors sequester corrosive agents to prevent them from staining the aluminum surface
- **Chemical absorption**
 - Inhibitors form an organized protective layer through chemical bonding on aluminum surface

How Phosphate Esters Work as Staining Inhibitors?

- By forming a thin, protective layer on the metal surface that
 - Inhibits corrosion and staining
 - Acts as a barrier against the corrosive effects of water and other substances.

ColaCor 900

- Branched alkyl Phosphoric acid esters
 - The effective chain length of the alkyl groups estimated to be 8-10 carbons
- A mixture of mono- and di-phosphate esters
- Contains ~8% phosphorus
- In an acid form
- Oil soluble as is
- Effective upon neutralization
- Primarily designed for soluble oil and semi-synthetic MWF.



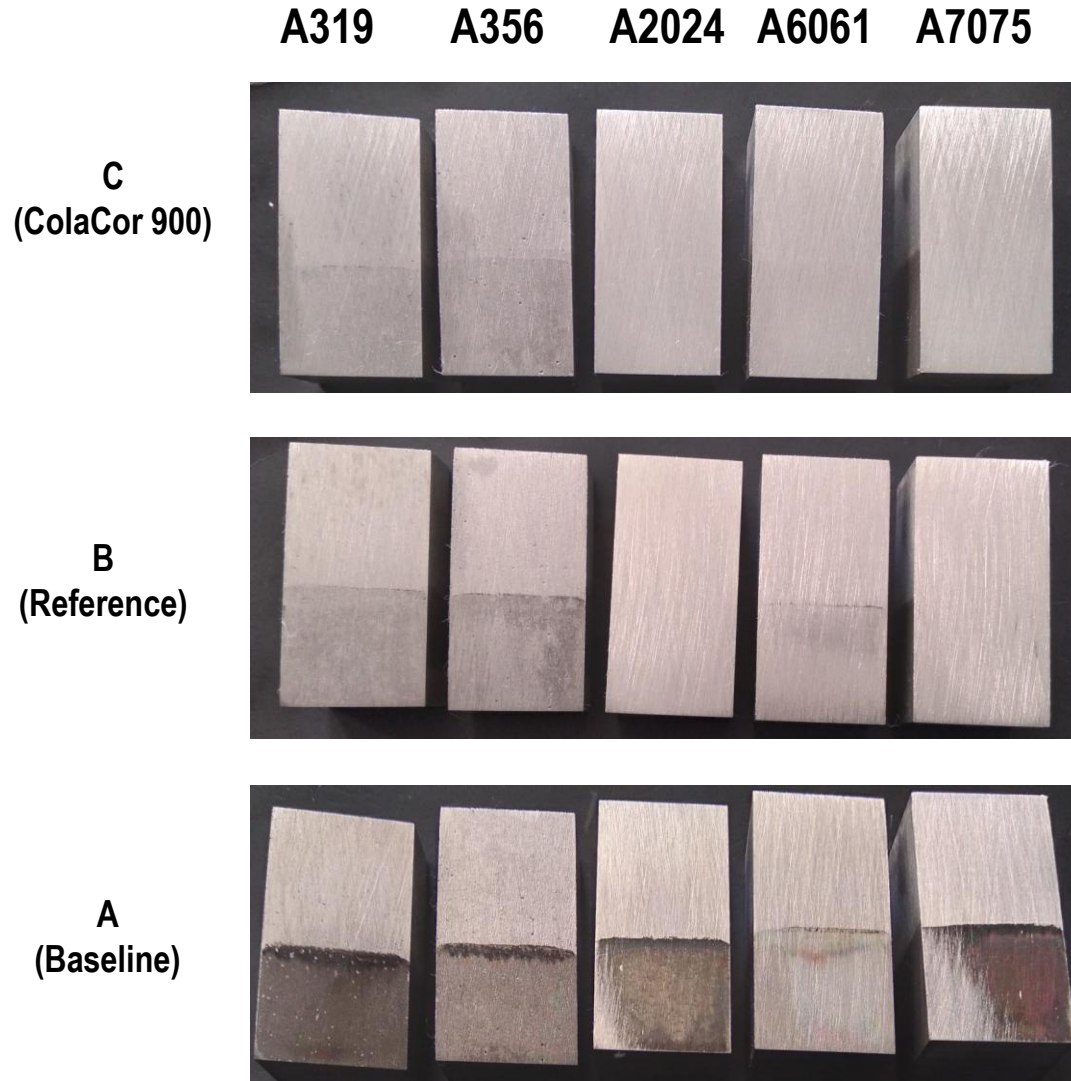
PROPERTY	SPECIFICATION	METHOD
APPEARANCE	CLEAR AMBER LIQUID	CCI-0001
CLARITY	CLEAR	CCI-0001
pH (10% in IPA/H ₂ O)	1.5 – 3.5	CCI-0017
ACID VALUE, pH 5.5	145 – 155	CCI-0068
ACID VALUE, pH 9.5	215 – 235	CCI-0068
% MOISTURE	1.0 MAX.	CCI-0013
COLOR, GARDNER '98	8 MAX	CCI-0021
COLOR, GARDNER BYK	REPORT	CCI-0069

Medium-oil, Semi-Synthetic Fluids

Additive	Wt%		
	A	B	C
100 SUS naphthenic oil	35.0	35.0	35.0
ColaLube 3449	6.50	6.50	6.50
High rosin tall oil fatty acids	2.00	2.00	2.00
ColaLube 3440	5.00	5.00	5.00
ColaLube 3430	4.00	4.00	4.00
Colonial A225	3.00	3.00	3.00
Marlox RT-42	2.00	2.00	2.00
ColaCarb TCAM	2.00	2.00	2.00
DI Water	1.50		
industry Reference		1.50	
ColaCor 900			1.50
ColaCor 186	0.75	0.75	0.75
Triethanolamine	6.00	6.00	6.00
Synergex LA	2.00	2.00	2.00
ColaCor RP	4.00	4.00	4.00
ColaCor 300	2.00	2.00	2.00
Propylene glycol	2.50	2.50	2.50
DI Water	21.15	21.15	21.15
Fungicide	0.30	0.30	0.30
Benzotriazole	0.25	0.25	0.25
Foam Ban HP-940	0.05	0.05	0.05

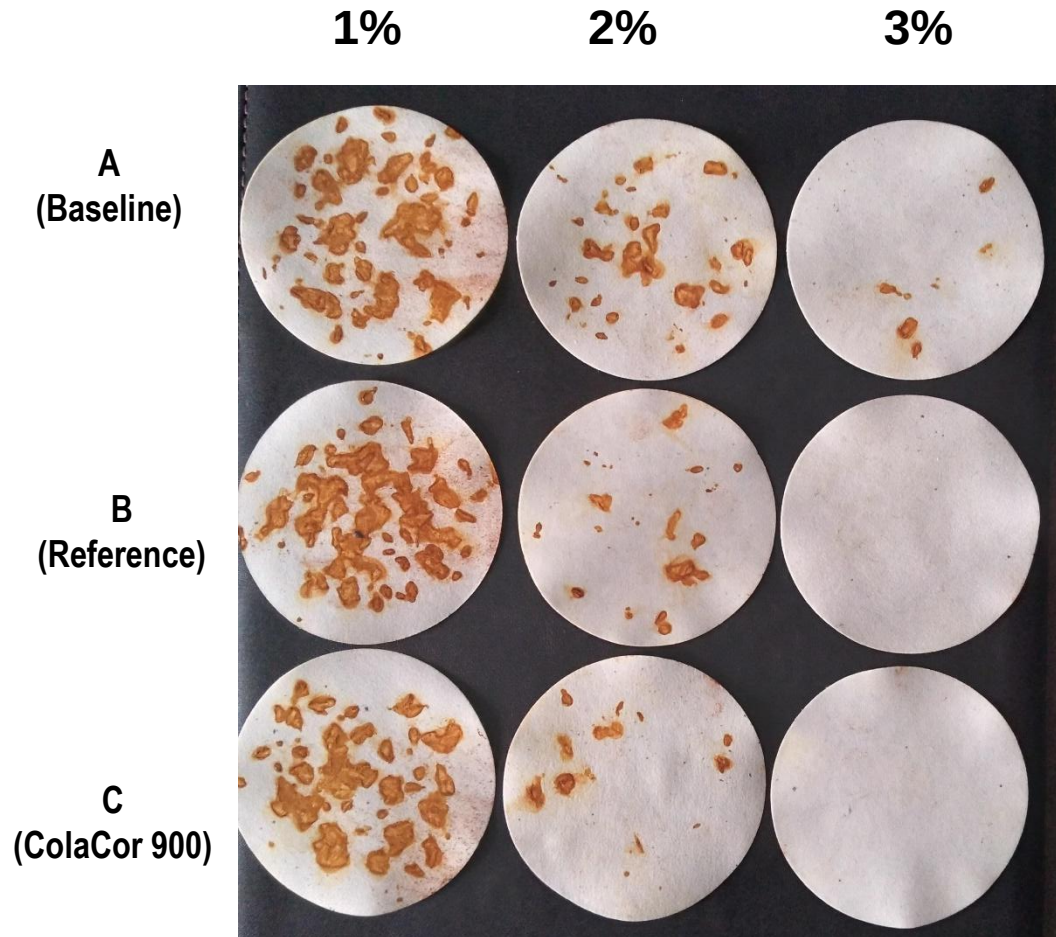
- Design of the study
 - **A**: a Colonial MOSS, baseline formula
 - **B**: containing an industry reference
 - **C**: Containing ColaCor 900
- About the baseline (**A**)
 - Trimmed down to remain stable for a limited shelf.
 - But capable of providing sufficient ferrous protection at 4% dilution
- Additives in **BOLD GREEN** are from Colonial
- When blending, start from the top and mix ingredients sequentially

Aluminum Staining Test



- Tested at 5% dilution in 150 ppm hardness water for 24 hours at ambient temperature.
- Phosphate esters (**B & C**) showed clear advantages over the baseline formula (**A**) on the staining inhibition on all Aluminum alloys tested.
- ColaCor 900 eliminated staining on high-grade aluminum alloys while offering satisfactory staining prevention on cast aluminum.
- ColaCor 900 demonstrates visible advantages in staining prevention over the industry benchmark.

Cast Iron Chip Test in 150 ppm hardness Water



- Tested at 150 ppm hardness water.
- Conducted under a revised ASTM D4627 protocol
- Phosphate esters (**B & C**) significantly improved the ferrous protection capability

Other Comparative Studies Conducted

- Concentrate stability
 - The baseline failed the room temperature stability study at week 8 while the two phosphate esters containing concentrates remained stable.
 - The phosphate esters impart the emulsification power.
- Emulsion Hardwater Stability Study
 - All three emulsions shows good emulsion stability at 1000 ppm hardness up to 1 week.

- Foam Test
 - Completed at 5% dilution with mild shear force w/ & w/o AF's presence
 - Phosphate esters have a higher foaming tendency
 - The foaming behavior appears to be manageable with anti foaming agents.

Sample	Seconds to collapse	
	W/O AF (in tap water)	With AF (in DI water)
A	4/18	12/15
B	43/60	17/23
C	45/60	16/22

Take-Home Messages on ColaCor 900

- Outstanding aluminum staining inhibitor
- Outstanding ferrous corrosion inhibitor.
- Emulsification capability.
- Extreme-pressure wear protection.

Tips for Use

- Suggested Application pH: 9.0 (8.5 ~ 9.5)
- Effective in the neutralized form.
- For soluble oils & semi-synthetics, & even synthetics
- Suitable for oil-based applications: in-between process rust preventives, drivetrain fluids, etc.

Thank you!

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Link for samples & documentation:

<https://colonialchem.com/products/colacor-900/>

