



Dissolvine[®] GL

the **green** and sustainable solution
for a diverse application base

Black & Green Conference
University of York
November 10, 2010



Overview



- AkzoNobel in Chelates
- Chelates in Cleaning
- Attributes of the ideal Chelate
- Dissolvine[®] GL product characteristics
 - Strong
 - Versatile
 - Safe
 - Sustainable
- Conclusions



Dissolvine[®] Chelate Product Family

-  EDTA
-  DTPA
-  GLDA
-  HEDTA
-  NTA
-  PDTA
-  CSA
-  EDG (HEIDA)



-  Manufacturing
-  Manufacturing, R&D

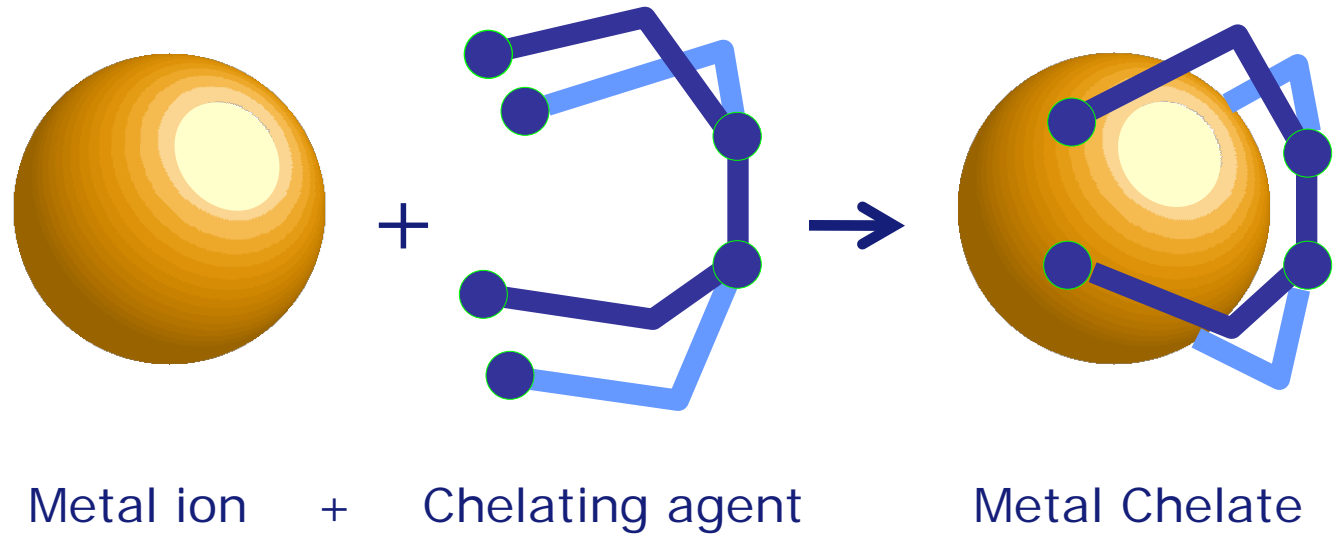


The **only** chelate manufacturer with integrated global manufacturing

New Plant in China operational as of November, 2010

Why use Chelates in cleaning?

From *Chelos* (greek) “crab”



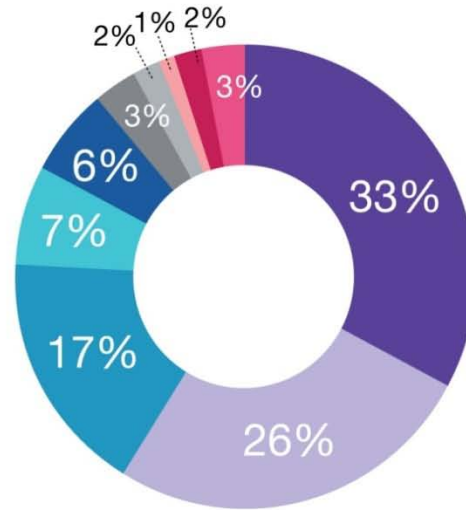
Preventing “hard” metal (Ca, Mg) salt precipitation

Reducing the effect of M^{2+} ions resulting in better surfactant performance

Controlling metal (Cu, Mn, Fe) decomposition, resulting in longer shelf life

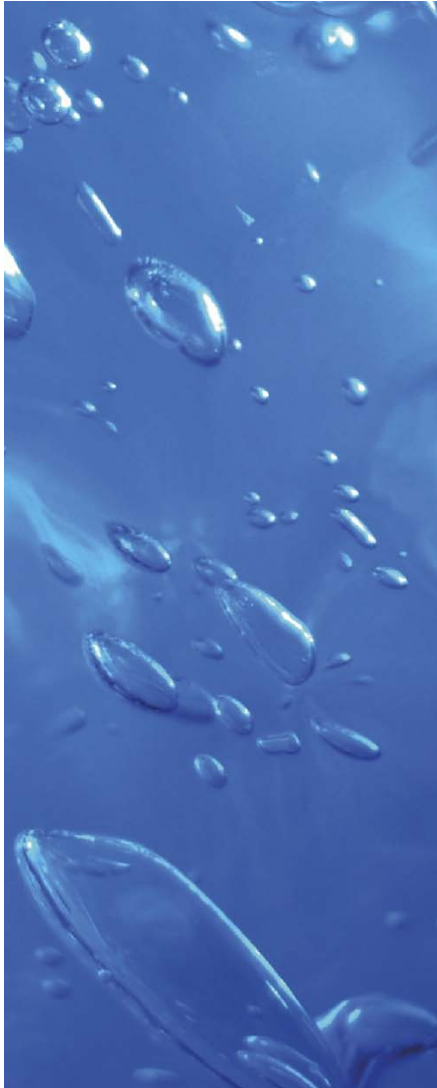
Boosting preservative or biocidal performance

Main Applications



- Micronutrients
- Detergents & Cleaners
- Pulp & Paper
- Photography
- Oilfield
- Food
- Metal Plating
- Pharmaceuticals
- Cosmetics, Health & Personal Care
- Others

Market size € 510 mln



Why look for a new chelate?

Traditional chelates / builder components are under intense scrutiny:

- **EDTA** (not readily biodegradable)
- **NTA** (potential carcinogen)
- **DTPA** (not readily biodegradable)



What about other alternatives?

Alternatives solutions come with constraints:

Phosphates

- Cause environmental concerns

Phosphonates & Polymeric components

- Too weak to bind hard water ions
- Not enough detergency power

Citrates

- Not strong enough

Zeolites

- Not soluble at all in cleaning

New Chelates such as IDS, HEIDA, EDDS

- Not strong enough for hard water ions



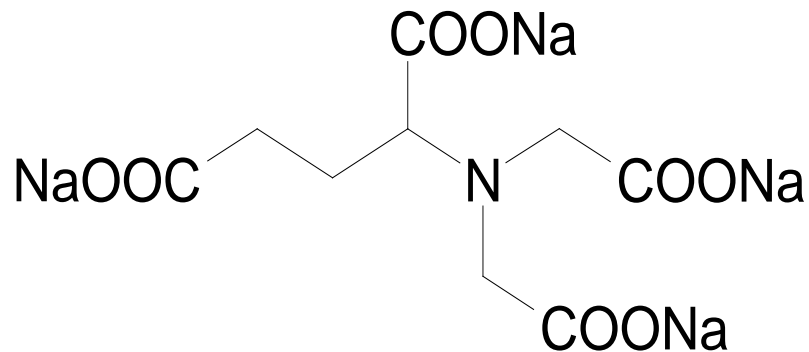
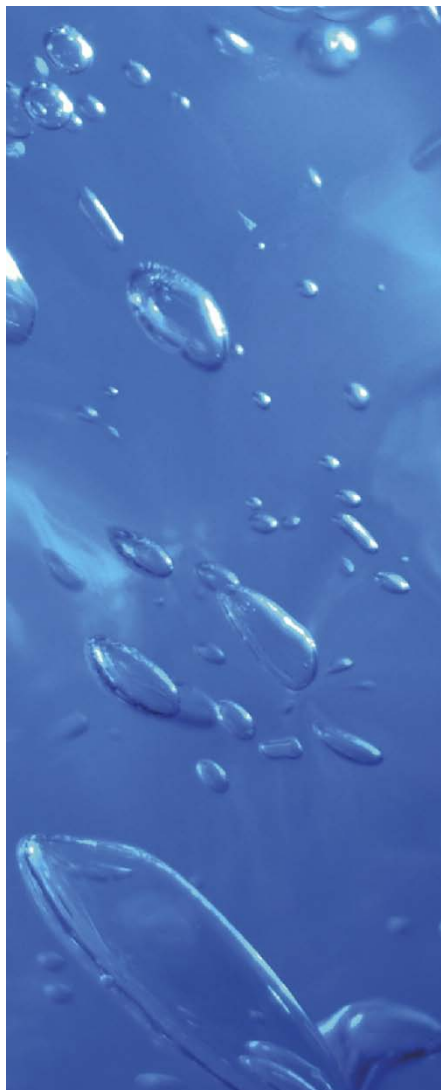
Attributes of the 'Ideal Chelate'

- Readily biodegradable
 - Good tox and eco tox profiles (safe for all)
 - Natural or renewable source
 - Sustainable
-
- **And it has to work...**



Dissolvine[®] GL (GLDA)

Our eco-friendly chelating agent



What is GLDA?

- Full chemical name: Glutamic acid, N,N-diacetic acid
- GLDA-Na₄ = **Dissolvine[®] GL**

Based on sugar (bio)chemistry:

- biochemical conversion of plant material (sugar beet waste) to MSG
- chemical conversion to strong chelating agent

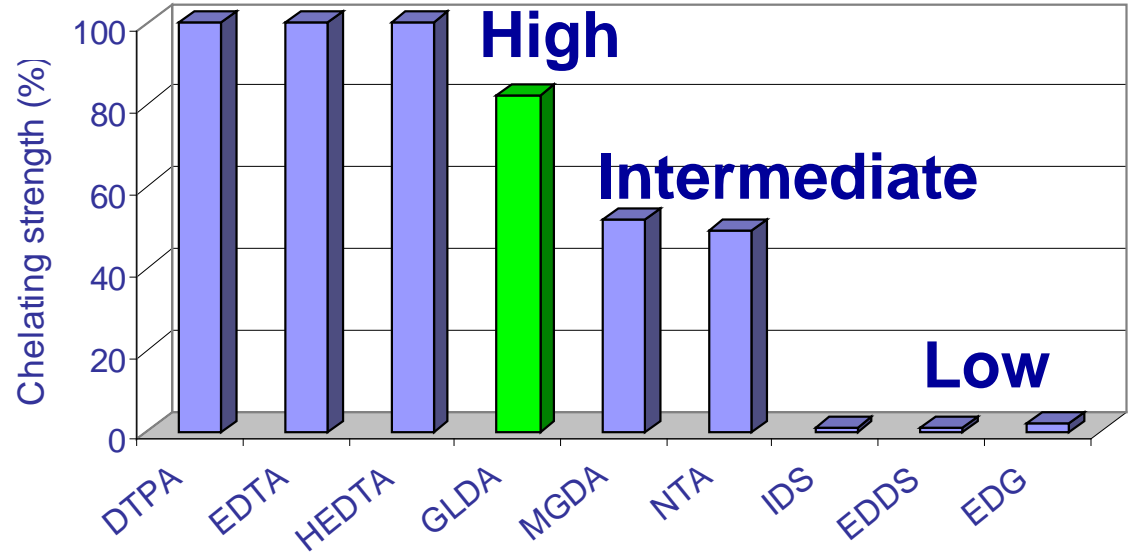
Strong



Dissolvine[®] GL – Calcium Chelating Strength in functional test at pH 10 with competing chelating agent



Very High



Conclusion: GLDA is a strong Ca binder

Versatile

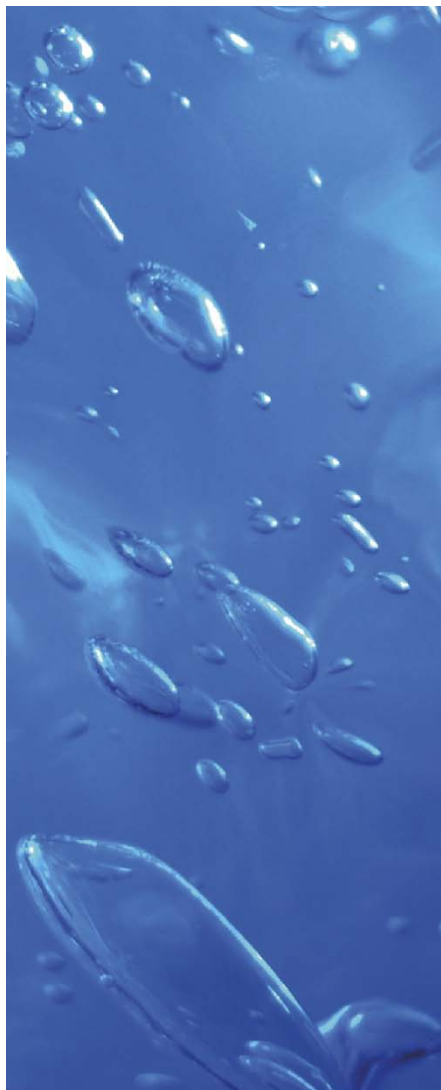


Active pH range for Dissolvine[®] GL

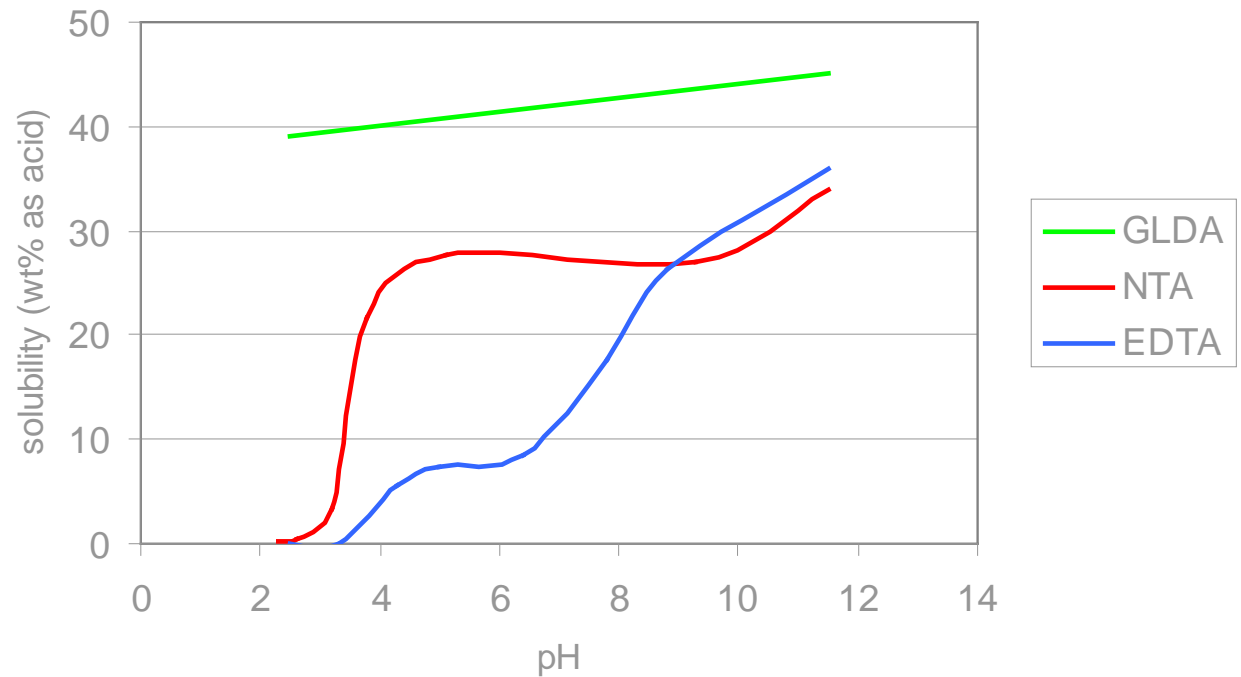
Metal ion	Ca²⁺	Cu²⁺	Fe³⁺	Mg²⁺	Mn²⁺	Zn²⁺
Active pH range	6-14 ⁽¹⁾	2-11 ⁽²⁾	2-8 ⁽²⁾	7-10 ⁽¹⁾	5-10 ⁽²⁾	3-12 ⁽²⁾

1. Based on calculations using the conditional stability constants
2. Based on experimental data

GLDA is active over a wide pH range



Dissolvine[®] GL – Solubility in Water (for GLDA: 45w% acid = 61w% Na₄-salt)



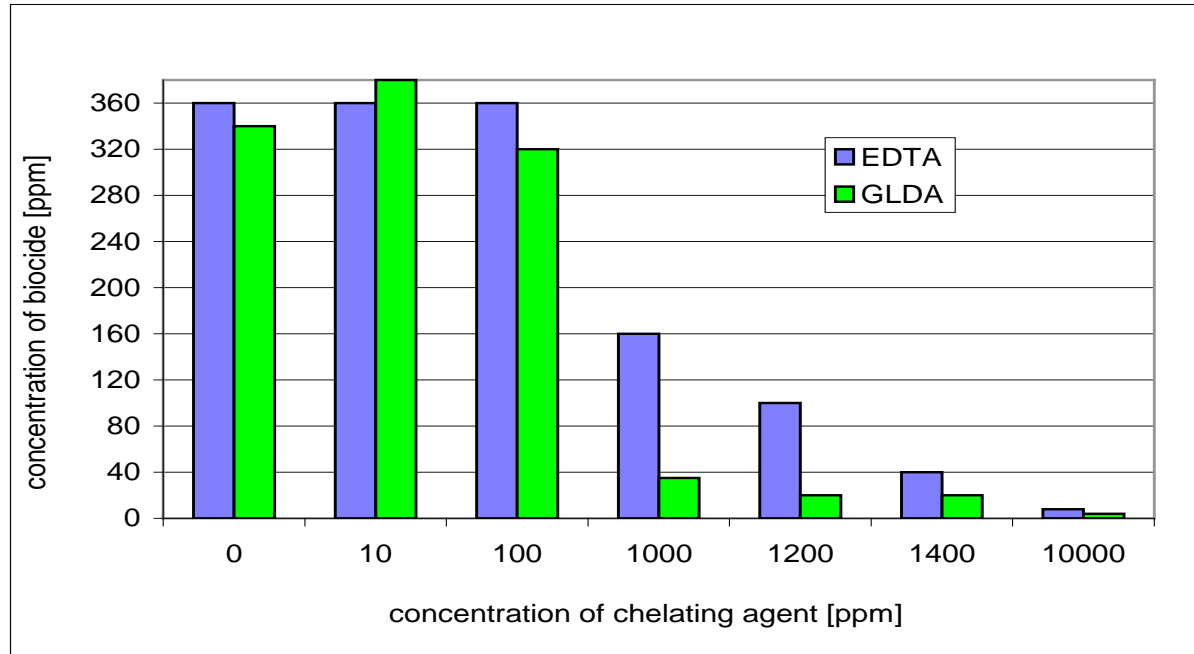
GLDA has excellent solubility in water

Dissolvine[®] GL – Solubility in Caustic



GLDA has excellent solubility in Caustic

Dissolvine[®] GL – Biocidal boosting



Pseudomonas aeruginosa (DSM 939, = gram – bacterium)

5% Arquad MCB-50 in concentrate

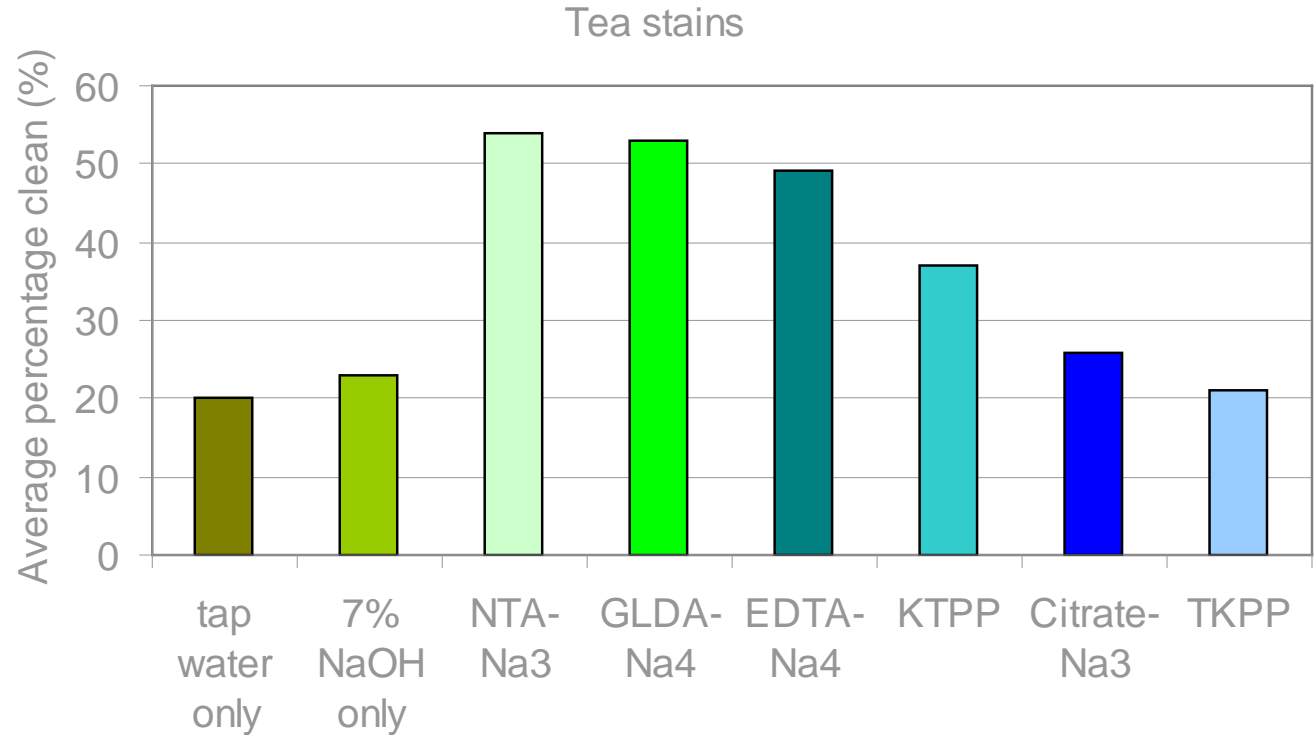
0,03% protein load, 17°dH water hardness, pH=10

Test method: EN 1276

Conclusion: GLDA is more effective

Stain removal in machine dishwashing

Formulation containing 7%NaOH, 11.4% sequestrant, balance demi-water



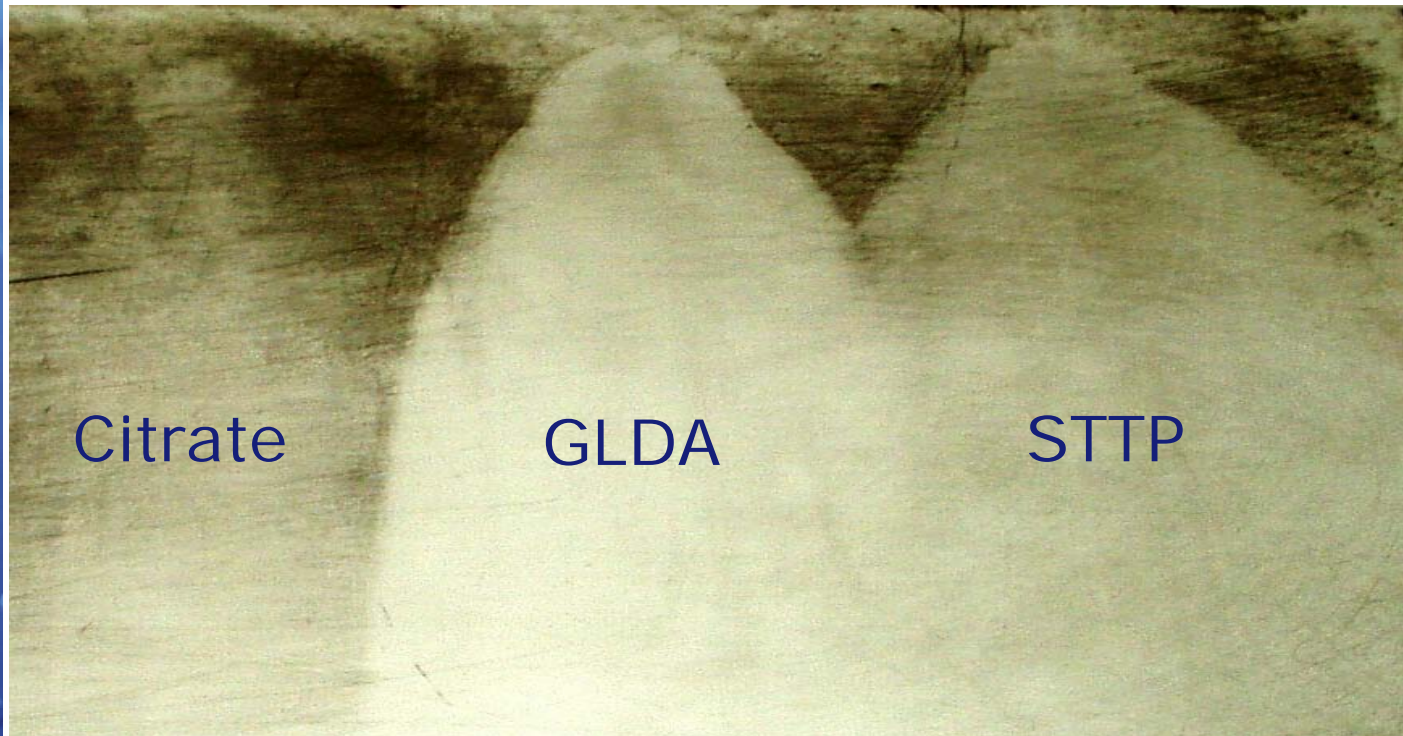
KTPP: potassium tripolyphosphate
TKPP: tetrapotassium pyrophosphate

GLDA is comparable to NTA and better than EDTA or phosphates

Vehicle and engine heavy duty cleaner

At room temperature and without mechanical force

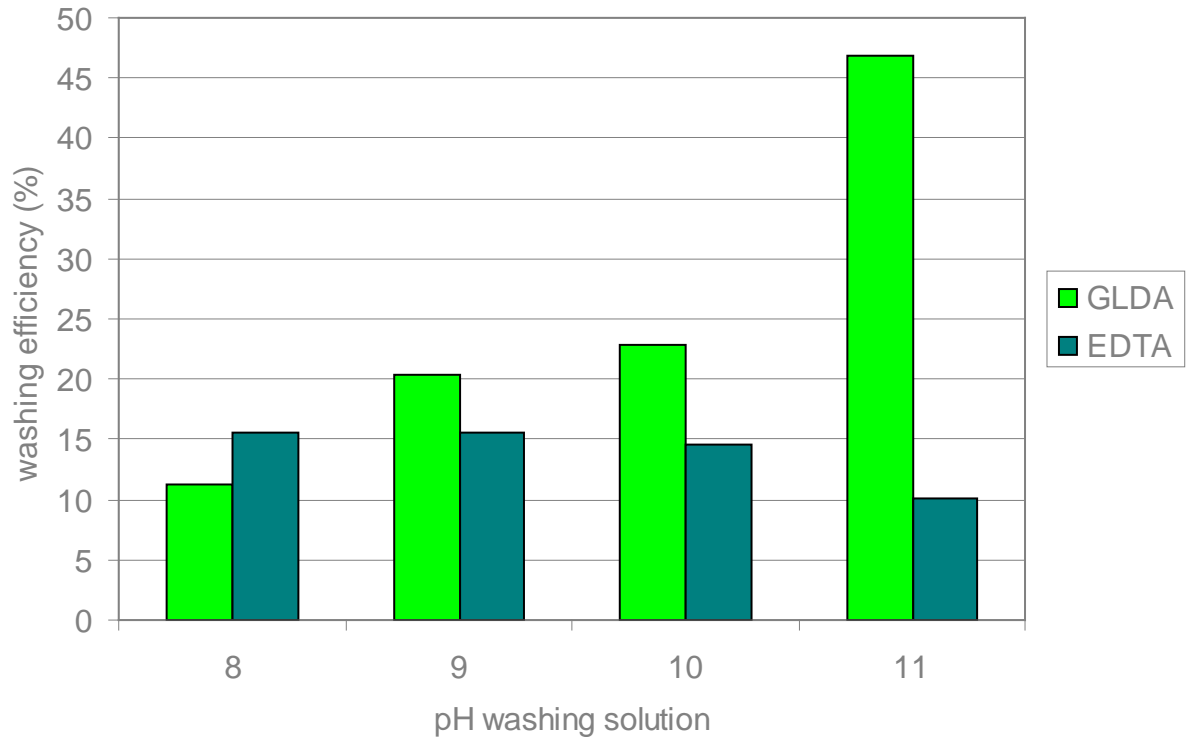
Automotive dirt removal test in *basic* recipe containing various builders and an optimized degreasing surfactant Berol[®] ENV226



Conclusion: GLDA works best

Oil and fat stain removal

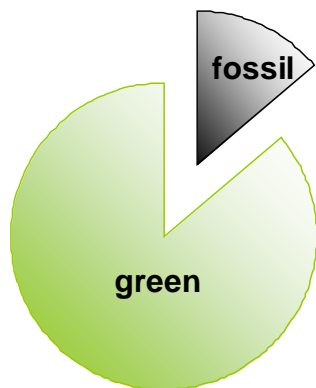
Formulation containing 0.05% non-ionic surfactant, 0.2M Na₂CO₃, 0.2M NaHCO₃, 0.2% chelate



GLDA is superior to EDTA under alkaline conditions

Small eco-footprint





- **Based on non-fossil raw material:**
 - Bra Miljöval protocol of Swedish society for Nature Conservation concludes 86% is based non-fossil origin

- **Biobased:**
 - Biobased content analyzed by 3rd party = 53% (5 out of 9 plant based carbon atoms)

- **Small eco-footprint:**
 - Eco-Efficiency Analysis proves that GLDA is the most ‘environmentally benign’ chelating agent



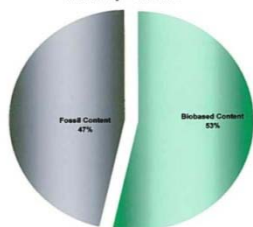
Beta Analytic Inc.
6885 SW 74 Court
Miami, Florida 33155 USA
Tel: 305-867-0187
Fax: 305-863-0964
info@betalabservices.com
www.betalabservices.com

Report of Biobased Content Analysis using ASTM-D6866

Submitter: AKZO Nobel
Submitter Label: DISSOLVINE GL-45-S
Laboratory Number: Beta-243162
Material Analyzed: BIOBASE LIQUID
Date Received: April 2, 2008
Date Reported: April 10, 2008

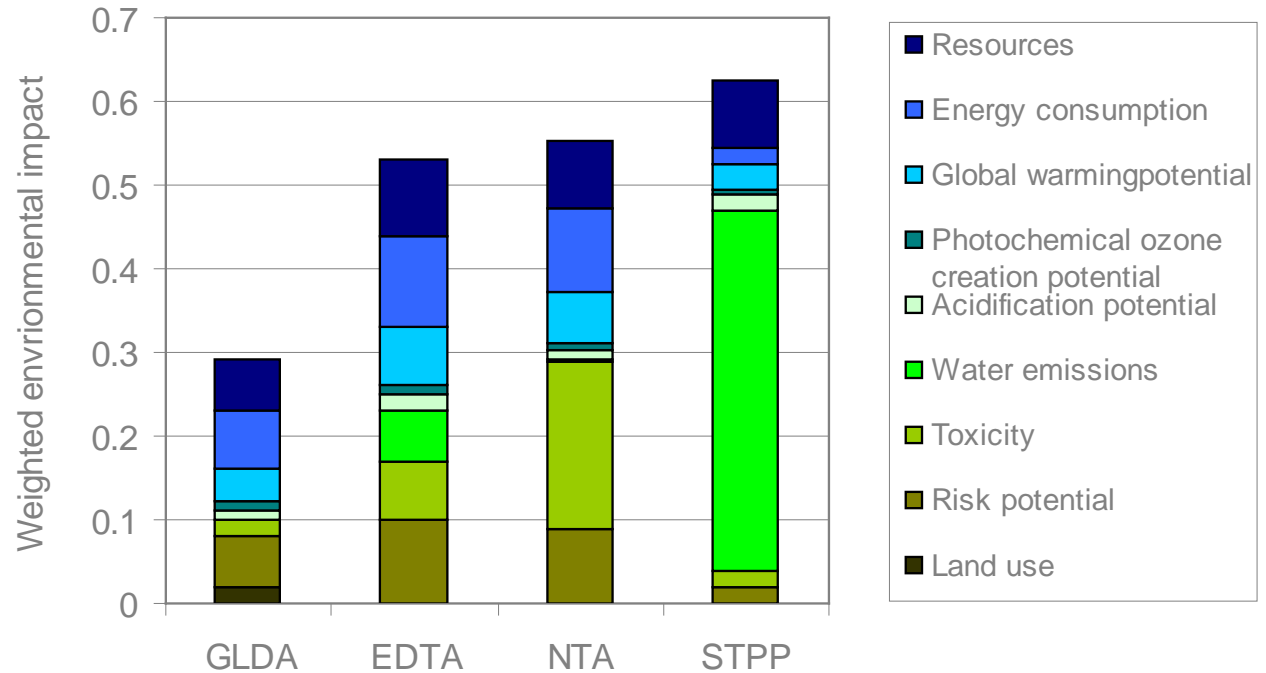
Mean Biobased Result: 53% *

Proportions Biobased vs. Fossil Based
Indicated by ¹³C content



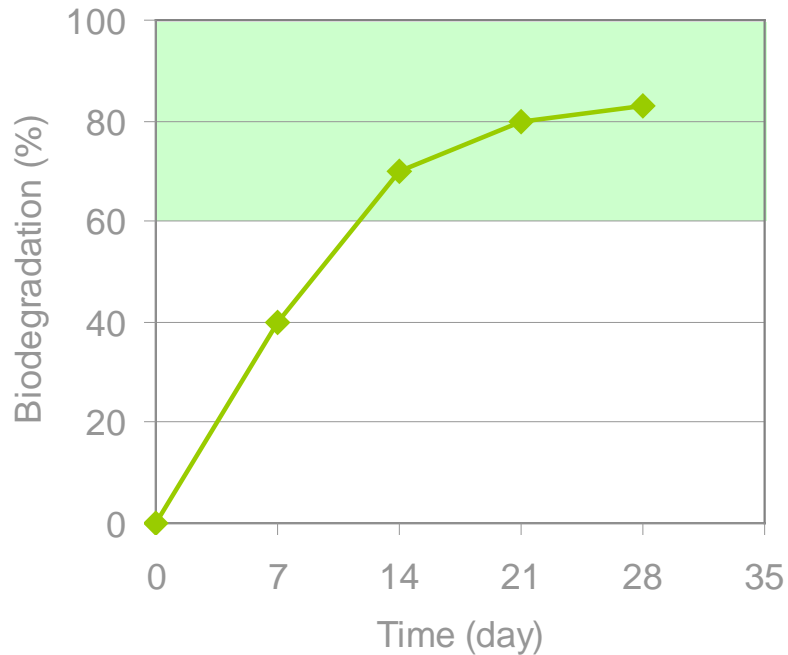
Dissolvine[®] GL – Weighted ecological footprint

Eco-efficiency on equal weight basis



Conclusion: GLDA has smallest footprint

Dissolvine[®] GL - Biodegradability



- **Readily biodegradable**
 - in Closed Bottle Test (OECD 301D)
 - imposed by EU detergents regulation
- **Ultimately biodegradable**
 - 100% conversion to CO₂, H₂O, biomass and mineral salts

Safe & Gentle

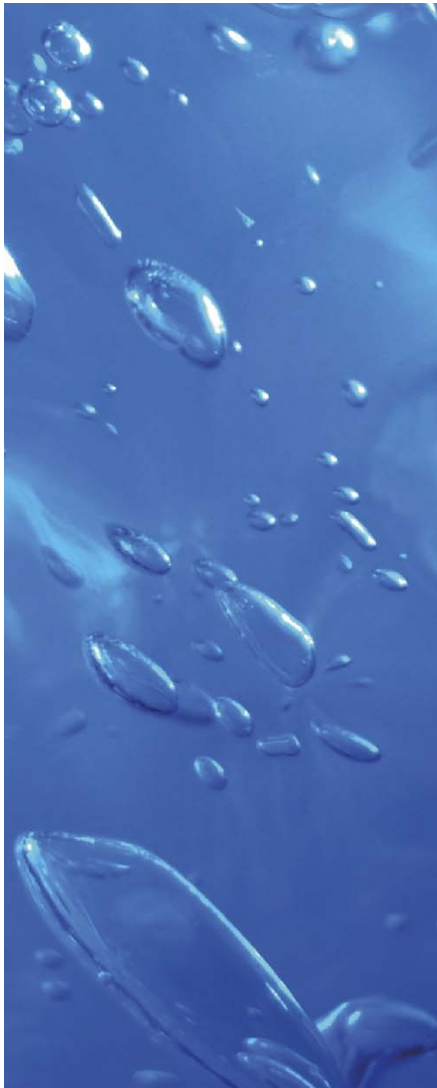


- **Low aquatic toxicity in acute tox tests**
 - Rainbow trout, Daphnia Magna and algae
EC > 100 mg/l
- **Low toxicity**
 - Low acute oral toxicity (rat): >2000mg/kg
 - Not irritating to skin or eyes
 - Not a skin sensitizer (Guinea pig)
 - Not mutagenic for cells or bacteria
 - Not genotoxic to mice
 - 90 day rate repeated oral dose, result:
NOAEL 300 mg/kg/day

Conclusion: No apparent safety issues

Green Labels

- **ECOCERT**, Authorized synthetic ingredient
- **NaTrue**, Accepted Ingredient
- **Euroflower**
- **Blaue Engel**
- **Nordic Swan**
- etc



Dissolvine[®] GL – Product Range

GL-38

- standard product
- Min 38.0% active ingredient
- <2.5% free NTA

GL-47-S

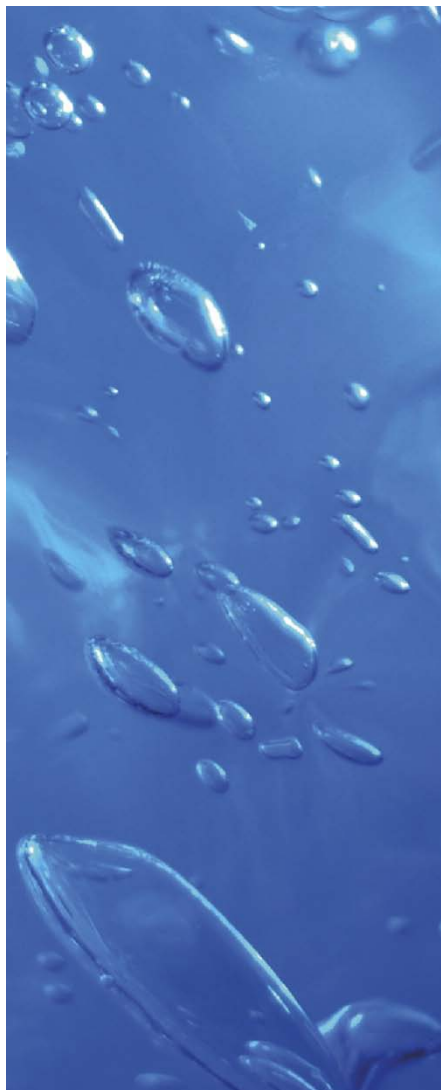
- high purity product
- Min 47.4% active ingredient
- NTA free

GL-NA-40-S

- acidic product
- Min 40.2% active ingredient
- NTA free

GL-PD-S

- powder of high purity product
- 82% active ingredient
- <0.20% free NTA



The chelating agent of the future is:



Strong



Readily
biodegradable



Safe for
man and
environment



Sustainable



AkzoNobel is proud to offer

Dissolvine[®] GL

as the Sustainable Chelate Solution

Thank you for your attention

Dissolvine[®] GL – Product Info

- For additional information please contact:

- **Tony Minshull**

- tony.minshull@akzonobel.com

- + 31 33 4676 221

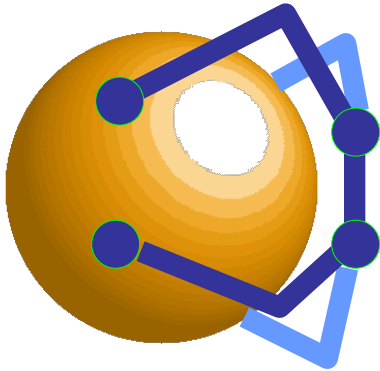
- or visit us at:

- www.DissolvineGL.com





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