Sapphire Repellency Treatment Technology

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Agenda

Aculon Overview

Aculon Technology Overview

Sapphire Repellency - Overview

Sapphire Repellency - Performance

Sapphire Repellency - Applications

Summary

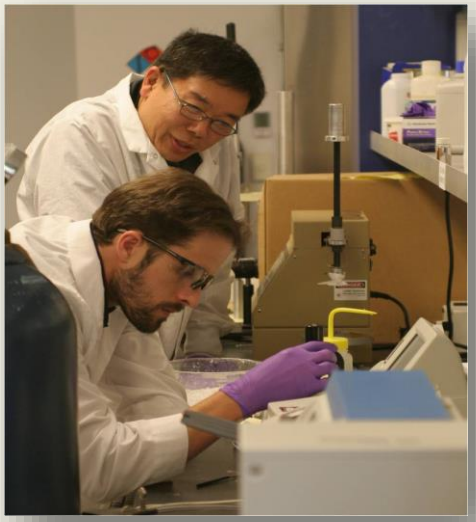
Overview

Aculon is a leading provider of surface modification technologies.

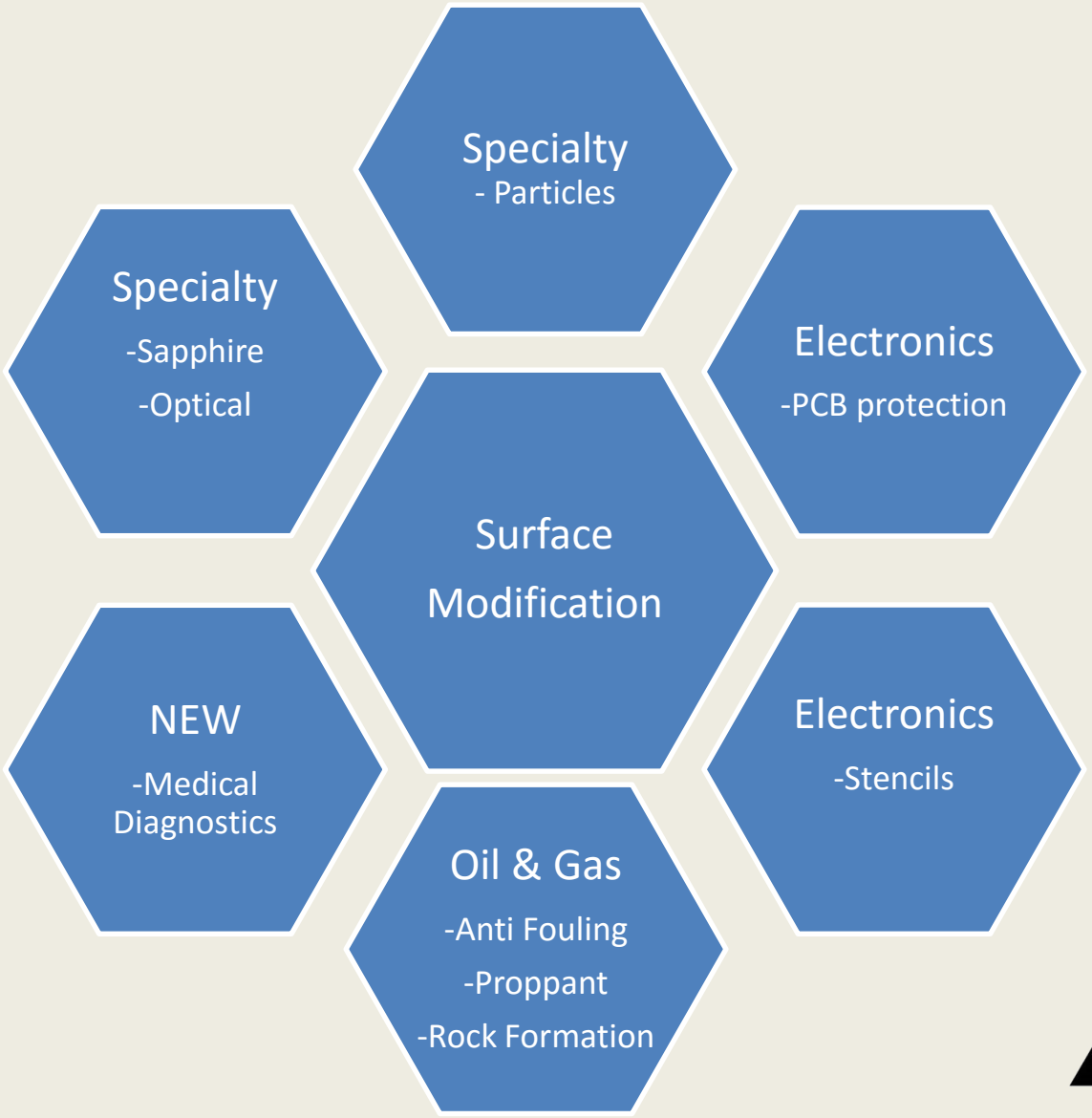
- Surface Solution Experts who supply treatments to large markets including oil & gas, consumer products & electronics – over 25 commercial programs
- Strong IP – 28 granted patents and 15 in process
- Provide repellency technology that modifying surfaces in seconds with little or no capital.
- Sapphire Repellency Treatments – Utilized in dozens of applications for over 5 years

About Aculon

- Specializes in developing and supplying easy to apply surface modification treatments
- Treatments Include : Hydrophobic, Hydrophillic, Oleophobic
- Located in San Diego, CA
- www.aculon.com



Expertise & Platforms



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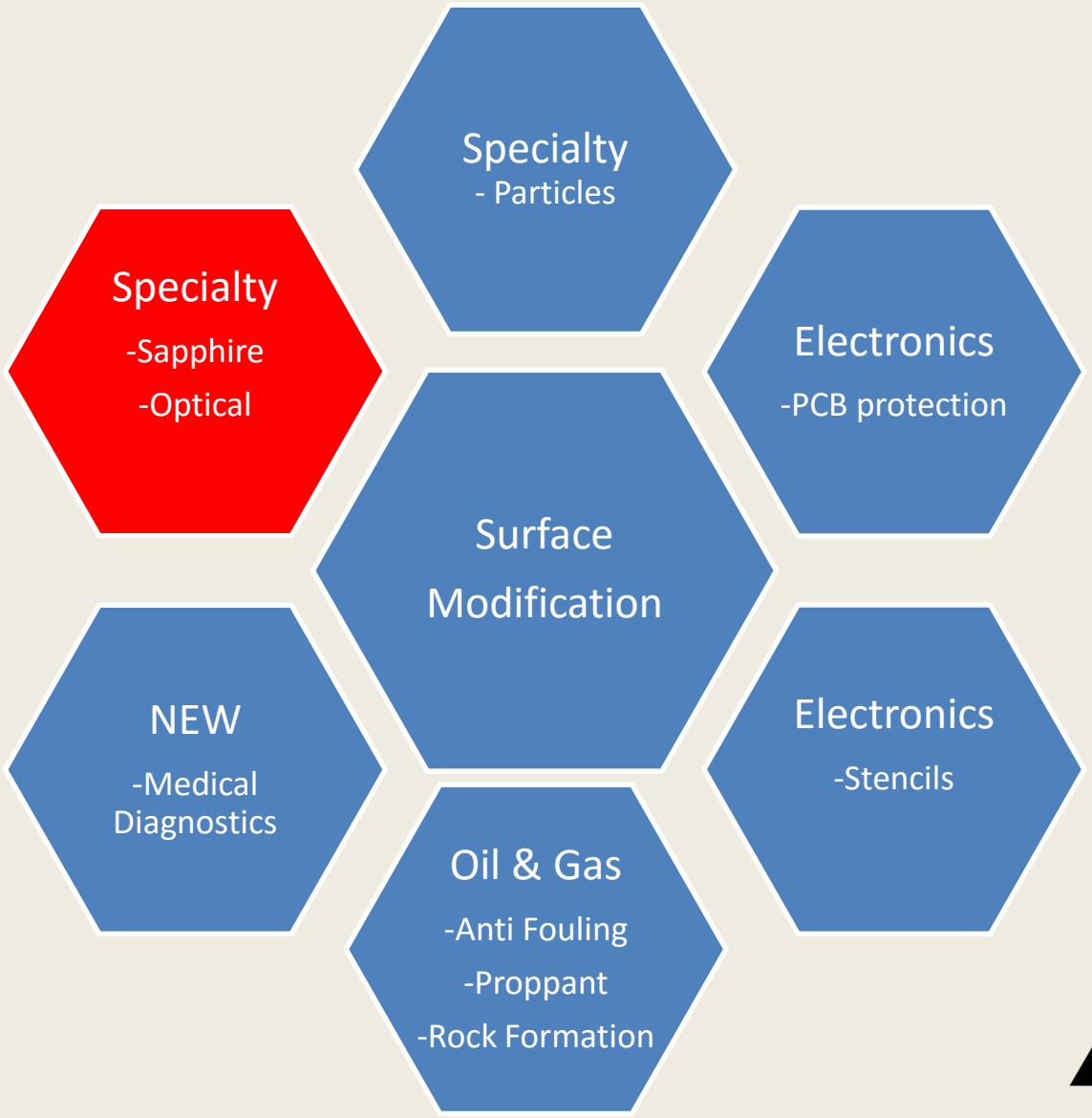
Expertise & Platforms



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Aculon Nanotechnology

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Why do you need repellent sapphire?

In real life, sapphire is exposed to water, oils, and other fouling agents which can inhibit its performance

- Fouled sapphire sensors can yield poor data
- Fouled sapphire can prevent viewing of pipeline or tank materials in oil/gas and industrial applications.
- Removing sapphire parts for cleaning often impossible or cost & labor prohibitive!

Numerous applications……

Aculon Sapphire Repellency Treatment qualified in variety of applications

- Optical Flow Sensors
- Oil Pipeline Viewports
- Downhole drilling optical sensors
- Sapphires utilized in analytical equipment
- Many others in test……

Benefits

Benefits include:

- Aculon Sapphire Repellency Treatment provides water, solvent, and oil protection.
- 2-4 nm thick, optically clear with 100% transmission
- Reduce cleaning and equipment downtime
- Enable ability to observe highly fouling solutions where viewports would immediately be visually impaired with untreated sapphire
- Extremely easy to apply in manufacturing environment or in field
- Coating is safe, non toxic and can be used in factory environment

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Application Process

Aculon will work with you to determine best application process...

- **Wiping: RECOMMENDED**
  - Process duration is typically minutes per part
  - Available via http://www.aculon.com/sapphirewipes.php in easy to use kits
  - Treat up to 1 square foot per kit
  - $25 per treatment
  - No training or equipment needed.
  - Apply in the factory or in the field

- **Dipping:**
  - Aculon can assist with dipping applications for complicated parts and large process volumes
  - Process duration is typically a matter of minutes
  - Aculon can provide support with implementing treatment into your production process
  - Contact Mario Gattuso (Gattuso@aculon.com) for more information

Direct Purchase Sapphire Treatment Kit

Aculon Sapphire Repellency Treatment is available off The Shelf

Each kit ($250 USD) includes

- Treatment for 10 sapphire parts of up to 1 square foot each
- Windex cleaning solution (good option)
- Instructions
- Aggressive cleaning solutions also available for critical components – please inquire
- http://www.aculon.com/sapphirewipes.php

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Aculon Solutions

Aculon NanoProof™ Series offerings utilize proprietary coating that makes objects hydrophobic

Sapphire Repellency Features

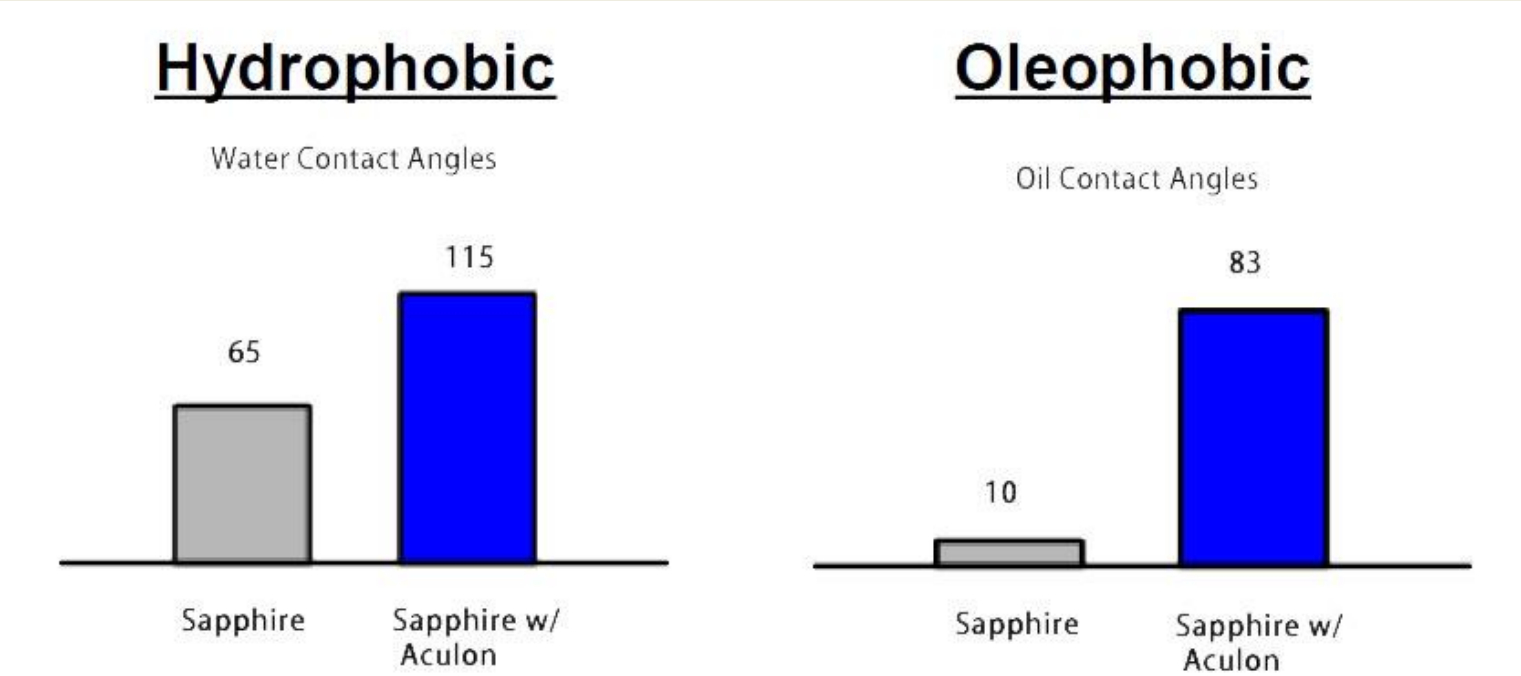
- Hydrophobic and oleophobic
- Optically Clear – 100% Transmission
- Application via Easy to Apply Wipe
- No Equipment Required
- Uniform Thickness 2-4 nm

Sapphire Repellency Performance

- Hydrophobic +115° water contact angle
- Oleophobic +80° oil contact angle
- Thermally stable to 225ºC
- Resistant to Solvents and Acids
- Abrasion Resistant – Durable Covalent Bond

Repellency

Aculon Sapphire Repellency is highly repellent to oil & water:



Crude Oil Repellency Videos

Aculon Sapphire Repellency Treatment Performance is easy to see!
Crude oil slides right off treated parts!

Durability

Abrasion

- **Covalent bond : 2-4 nm thick**
- **Durable to most all fluid flows – oil/water mixes, slurries etc**
- **Damage by abrasion only possible when underlying sapphire substrate damaged**

Chemical Compatibility

- **Compatible with organic solvents, neutral aqueous solvents & acidic solvents which do not etch untreated sapphire**
- **Not Compatible with caustic solvents (pH 10+)**

UV & Temp

- **Stable to 225C**
- **Impacted by UV – But can be reapplied in field**

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Analytical Sapphire Optics

- **Prevent condensation & moisture build up on sapphire parts**
- **Prevent nearly all liquids from fouling surface or bonding with surface**
- **Improve ease of cleaning optics – reduce risk of damaging sensitive components**

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Oil & Gas Applications

Optical Viewports

- **Prevent paraffin fouling**
- **Compatible with most oil/water material flows**
- **Fouling agents slide off and allow for viewing without cleaning**

Down Hole Sensors/devices

- **Eliminate hours of downtime and cost needed to remove sensors for cleaning of sensitive optical**

Optical Analytical Sensors

- **Accurate measurement results improved by eliminating fouling agents which can interfere with sensors**

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Summary

In summary

- Leading supplier of NanoScale Repellency Technology
- Sapphire Repellency Treatment functionalizes sapphire with no impact on transparency
- Samples available on the website http://www.aculon.com/sapphirewipes.php
- Easy to apply
- No Equipment needed
- Cost reduction from improved process
- Proven to outperform competitive technology
- Aculon supply chemistry globally

Performance • Surface • Solutions

Thank you