L-Act biological surface modification

- make polymers wettable
- For cell culture
- For painting
- activation of inert surfaces

- biological origin
- green process
- affordable
- fast

green process

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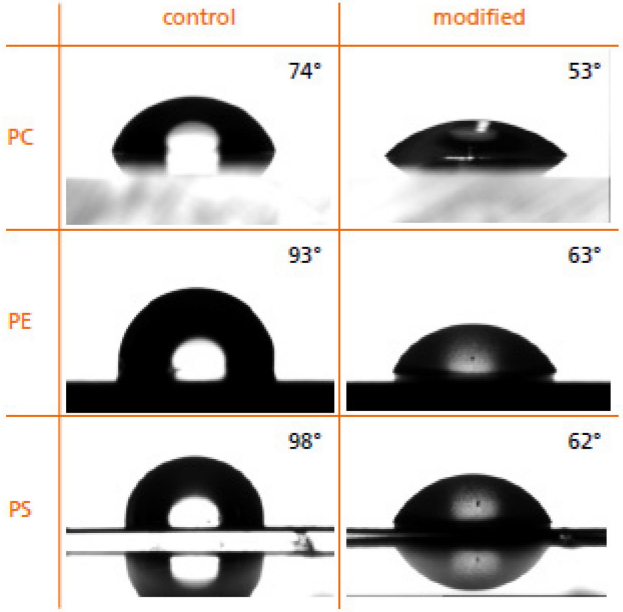
1. Contact Angle

The natural enzyme is designed to bind to hydrophobic surfaces, which is turning them hydrophilic and useful for multiple applications. It has been able to activate any surface but teflon®.

We tested polymers made from

- polystyrene (PS)
- polyethylen (PE)
- polypropylene (PP)
- Polycarbonates (PC)
- cycloolefins (TOPAS)

Treated surfaces are stable for >1 year (open and dry at room temperature).



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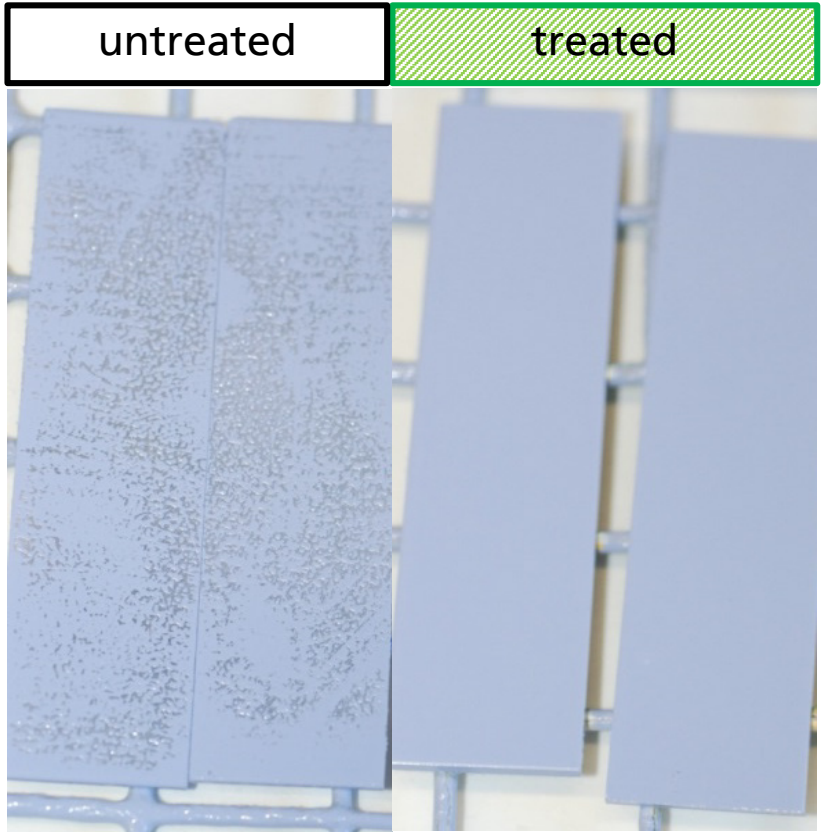
2. Painting

The activation of polymer surfaces can be used as a pretreatment befor paint and laquer applications. L-Act can substitute classical methods like chemical, flame, corona and plasma treatment.

- Low energy consumption
- Low price
- Environmental friendly
- No hazardous waste
- Applicable on complex 3D-components



Polypropylene substrates with a
VOC-containing 2-C polyurethane lacquer

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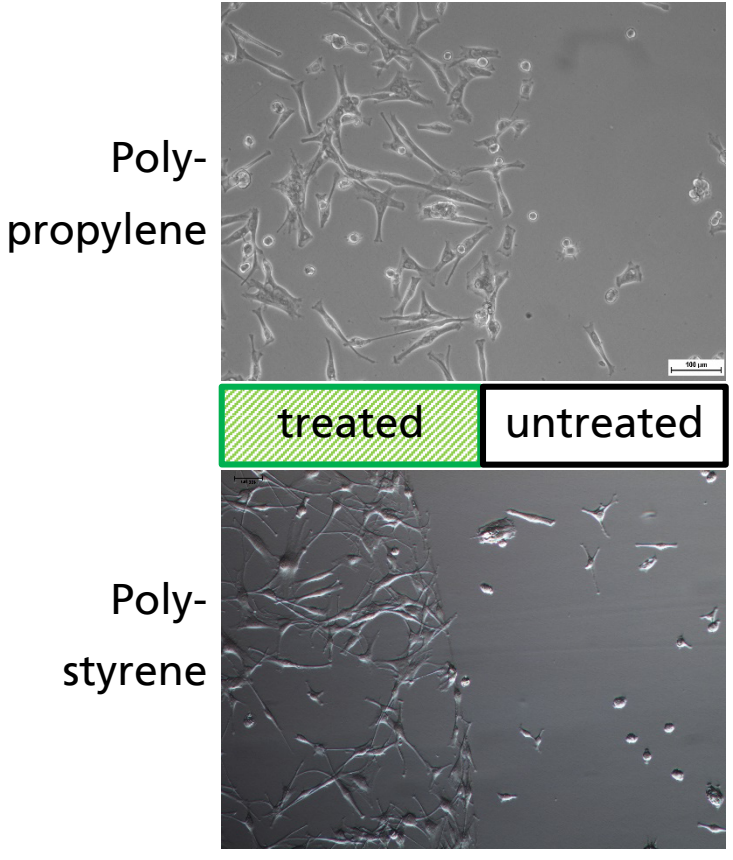
3. Cell culture

L-Act helps to activate surface making them suitable for cell culture.

L-Act can replace energy consuming surface activation (plasma, chemical, …), avoids the generation of toxic remains on the polymer surfaces and is applicable to any hydrophobic polymer surface.

Beyond this we have extablished further know how for including additional modifications.



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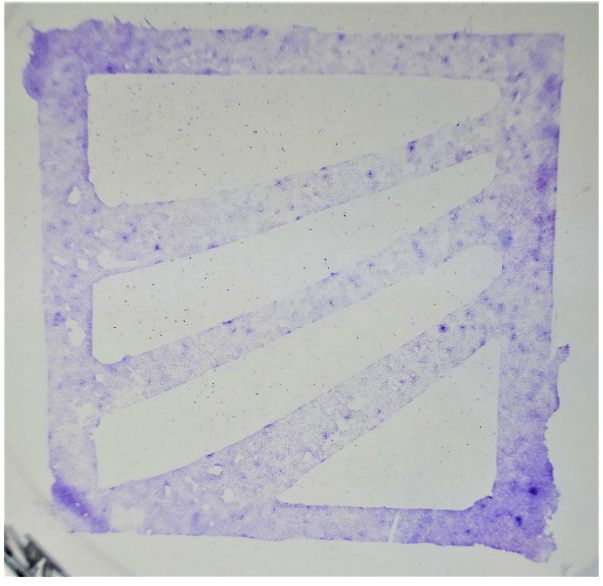
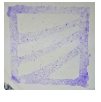
4. Printing

Most methods of activating surfaces require rough conditions and are diffcult to steer. L-Act can be used to activate selected areas with sharp boarderlines.

In the example on the right a filter matrix soaked with laccase solution was used to print the Fraunhofer logo in a petri dish (PS, not suitable for cell adhesion), generating a surface easily populated by eukaryotic cells.





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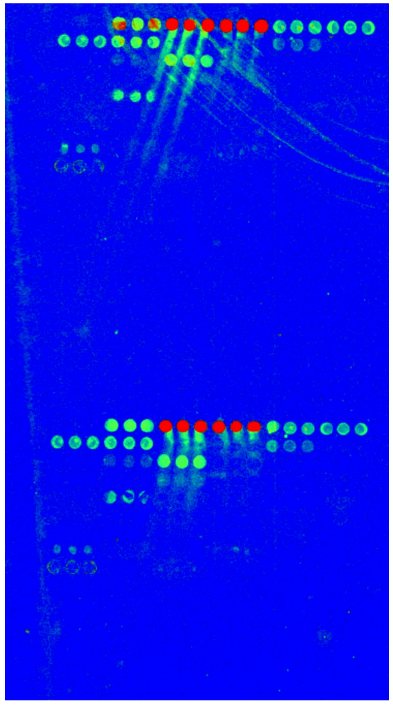
5. Priming inert surfaces - Arrays

Chemical modification of surfaces often starts with chemicals, which are not well tolerated by polymers or not suitable for the final application.

Modification of surfaces and subsequent chemical coupling of peptides generates useful and fluorescence background free peptide arrays on TOPAS. This is a special technology just recently developed measuring antibodies directed at different peptide epitopes after vaccination, infections and in autoimmune disease.



Left:

A series of peptide epitopes spotted in triplicates on activated TOPAS binding antibodies raised against a vaccine. Detection with Cy-5 labelled antibodies.

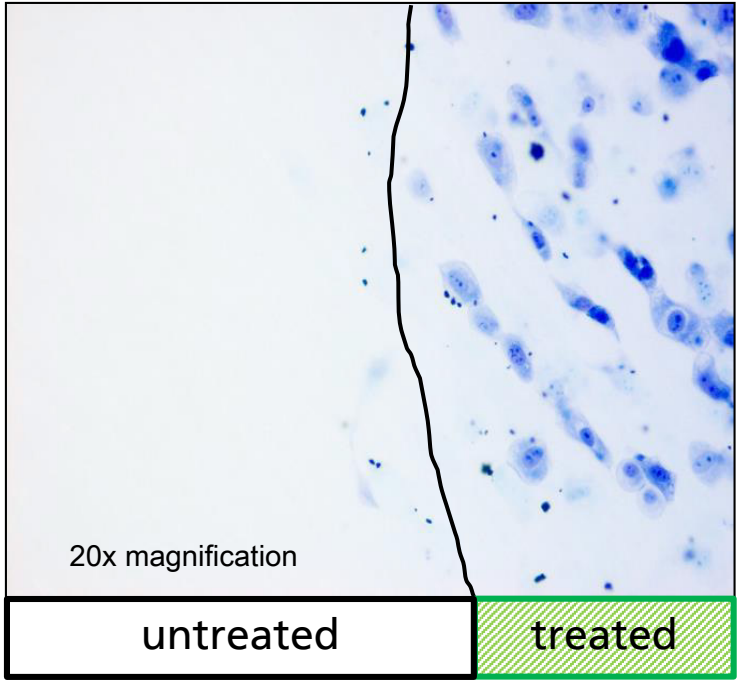
6. Medical implants

Polyetheretherketone (PEEK) is high potential polymer for dental and othopedic implants. PEEK is bioinert. To generate bioactivity peak must be treated by plasma, sputtering, wet chemical modifications and depositions.

Laccase can turn PEEK very easily into a bioactive implant.

The process can be applied easily under GMP conditions.

No special machines or manufacturing lines are required.



HT22 cells (mouse neuronal cell line) on PEEK, medical grade

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Advantages

L-Act surface activation is an outstanding method compared to many other methods established to activate inert polymer surfaces:

- No energy consumption
- No additional chemicals required
- The required enzyme can be produced economically in large quantities.
- Costs per m² are << € 1
- Perfect control of the addressed surface area, anywhere where a liquid can go
- Stable surface conversion

green process

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Literature

Key publications

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Patents

Composite with improved paint adhesion and method for producing the same, EP3009469 B1.

Method for marking or immobilizing a target structure, EP2895858 (B1), CA2885036 (C), US9193986 (B2)

Method for activating a surface by increasing the hydrophilicity and/or for binding target structures, US10011825 (B2), EP2861731 (B1)

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