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Bu proje Avrupa Birliği ve Türkiye Cumhuriyeti tarafından finanse edilmektedir

UNIVERSITÀ DI PARMA

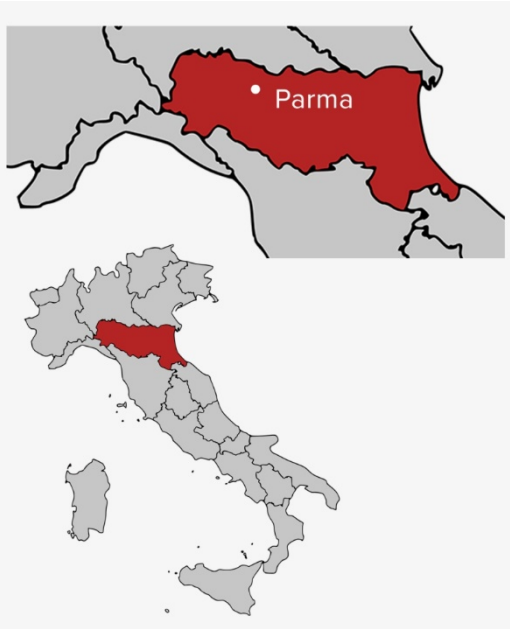
Department of Engineering and Architecture

Dr. Claudio Favi, Prof. Alessandro Pirondi, Dr. Adrian H.A. Lutey, Dr. Fabrizio Moroni, Prof. Luca Romoli, Prof.ssa Emanuela Cerri, Prof. Daniel Milanese

Email:*claudio.favi@unipr.it*

Description of the Organization

UNIVERSITÀ DI PARMA



- UNIPR is a non-profit public higher-education institution located in the urban setting of the small city of Parma
- The Department of Engineering and Architecture (DIA) of UNIPR is involved in several research projects and collaborations with industrial partners

Projects

TresClean, InSecTT, FATMOLS, DigiLab4U, ADACORSA, ..others

Collaborations

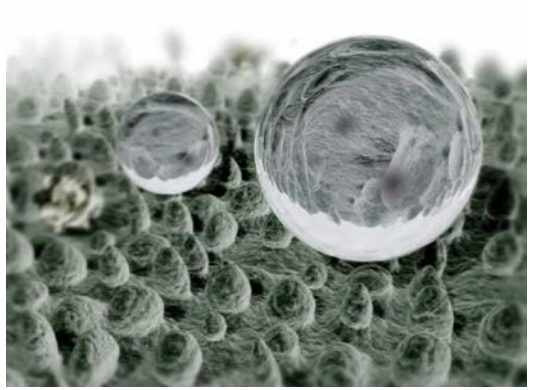
AIRBUS, Sidel, PLM4U CAD · PDM · PLM INTEGRATED SOLUTIONS, Electrolux, hyperlean, ..others

Green flexible and advanced manufacturing

HORIZON-CL4-2022-TWIN-TRANSITION-01-02: Products with complex functional surfaces

Goal

→ Development of surface topographies with fluid repellent and antibacterial properties over large areas (>500cm² for food industry, >5000cm² home appliance)



→ Lotus leaf effect

→ Adhesion of *Escherichia coli*

Method

→ **Ultrashort pulse (USP) laser texturing** to generate functionalized textures on stainless steel

→ **Near-field interaction modeling** to evaluate the behavior of bacterial cells in close proximity to a texture

Results

→ High throughput processing technologies for functional surfaces with an overall **structuring rate of up to 2000 mm²/s**

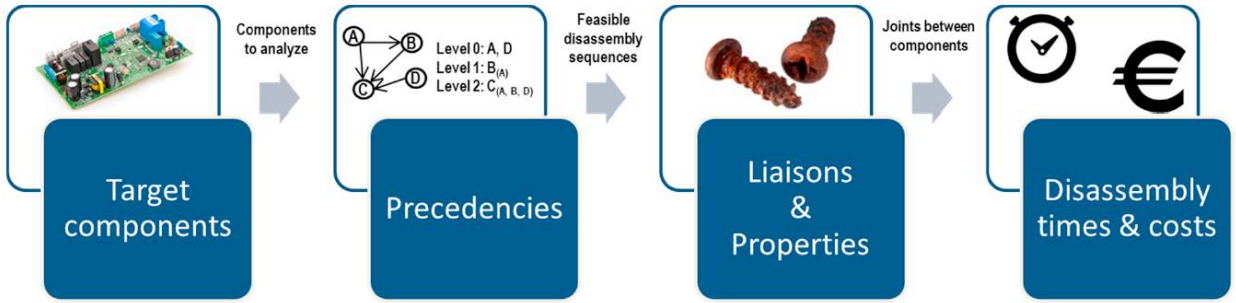
→ **99.8% Reduction of bacterial adhesion** for specific bacteria types on textured surfaces

Advanced digital technologies for manufacturing

HORIZON-CL4-2022-TWIN-TRANSITION-01-07: Digital tools to support the engineering of a Circular Economy (Made in Europe Partnership) (RIA)

Goal

→ To provide a **CAD-based software tool able to predict disassembly time, optimized sequence and tool list** (including supply chain parameters)



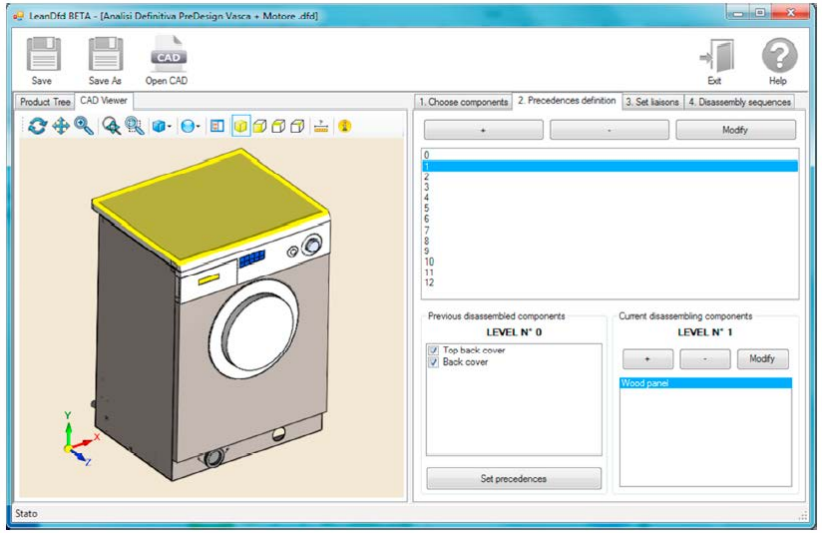
Method

→ To perform a **new list of Circularity Indices** for the evaluation of circular economies scenarios (Reuse, Reman, Repair) for target components in products

→ To develop **a CAD-based software tool for DfD**

Preliminary results

→ **LeanDfD tool –** It allows to analyse product disassembly and provide design feedback to engineers



→ **DfD DB –** It collects a list of item (liaisons) used to perform assembly task and related disassembly time

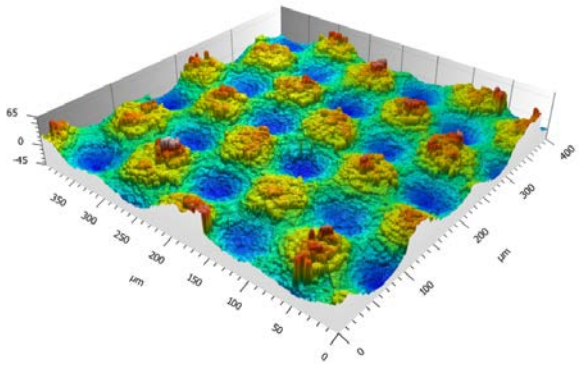
Green and sustainable materials

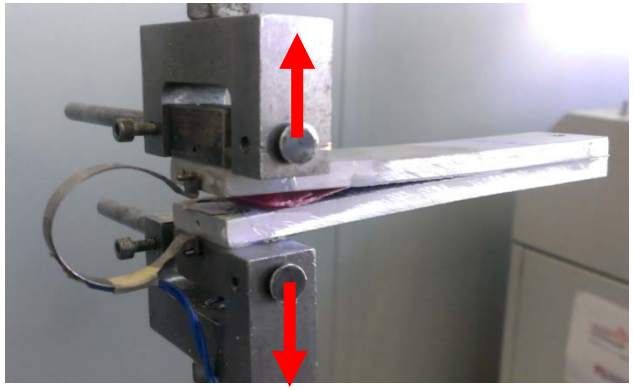
HORIZON-CL4-2022-RESILIENCE-01-11: Advanced lightweight materials for energy efficient structures (RIA)

HORIZON-CL4-2022-RESILIENCE-01-12: Functional multi-material components and structures (RIA)

Goal

→ Optimization of the laser surface treatment to promote the mechanical interlocking between adhesive and adherend in bonded joints





Method

→ **Characterization and prediction of surface morphology** of laser treated surfaces

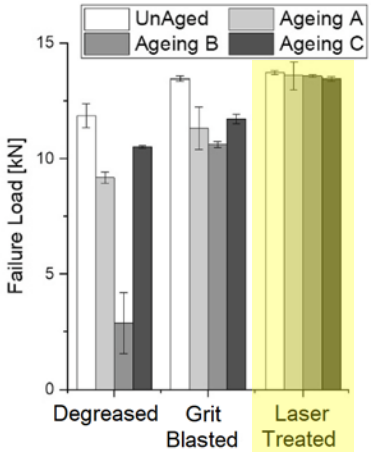
→ **Experimental test campaign** (static, fatigue and aged conditions)

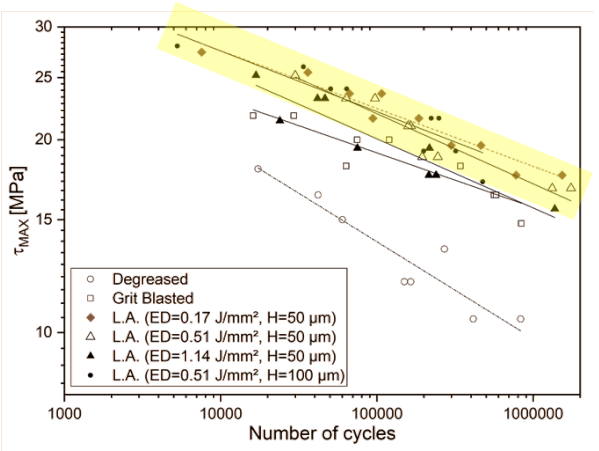
Results

→ **Static test:** higher strength if compared to traditional surface pre-treatment

→ **Fatigue Tests:** longer life of laser treated joints

→ **Better ageing** resistance of laser treated joints





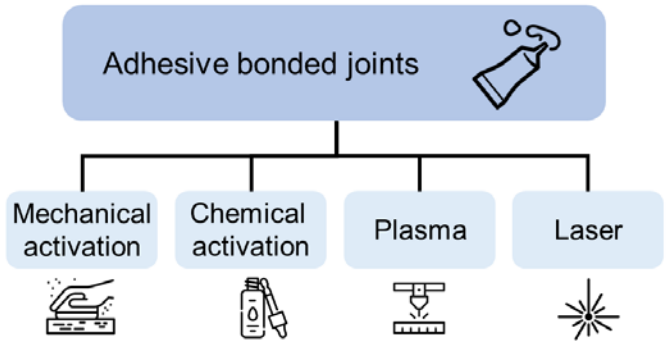
Green and sustainable materials

HORIZON-CL4-2022-RESILIENCE-01-11: Advanced lightweight materials for energy efficient structures (RIA)

HORIZON-CL4-2022-RESILIENCE-01-12: Functional multi-material components and structures (RIA)

Goal

→ To analyze the **environmental performance of adhesive bonded processes** for material assembly with **different surface activation processes** (i.e., laser irradiation and plasma treatment)



Method

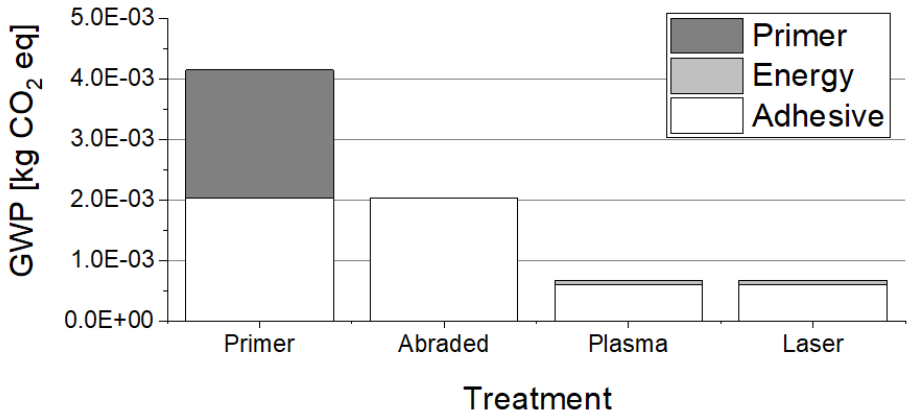
→ To perform an **experimental test campaign** (both static and dynamic)

→ To perform an **LCA analysis**

Preliminary results

→ **Tensile test (static) + Fatigue test (dynamic) campaigns:** optimization of process parameter (i.e., laser) and mechanical characterization of joint performance (static strength and fatigue life)

→ **LCA: Plasma and Laser** exhibit approx. the same results (**lowest impact** compared with abraded and chemical activated joints)



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REPUBLIC OF TURKEY
MINISTRY OF INDUSTRY
AND TECHNOLOGY

TÜBİTAK