Project Ideas

Center for Physical Sciences and Technology
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The largest scientific research institution in Lithuania (> 650 people)

- Institute of Chemistry
- Institute of Physics
- Institute of Semiconductor Physics
- Textile Institute
The areas of competence of the Institute of Chemistry:

- Functional coatings and materials (electroless deposition, electroplating, magnetron sputtering, ALD, anodizing)
- Electrochemical material science and corrosion research (Accredited Corrosion Laboratory)
- Spectroelectrochemistry (SERS)
- Characterization of materials structure (XRD, SEM, TEM, XPS)
- Tribology
- Chemical waste treatment technologies
Corrosion and Wear-resistant Aluminum Coatings
Lithuanian State Research Institute
Center for Physical Sciences and Technology CPST
(4 campuses, over 300 researchers,
~700 employees+PhD students)
• Dept. of Electrochemical Materials Science
  o Tribology Research (3 scientists)
  o Corrosion Research (8 scientists)
    - Includes Accredited Corrosion Laboratory

Spin-off SME „Alanodas“
• Coatings on Al and other substrates
  o 2 scientists
  o 9 employees
  o ~ € 0.5M turnover in 2016
Anodization is used to create hard coatings on Al and other metals:
- Casings (cell phone, airplane)
- Near-ideal black body (laser)
- Parts in robotics, clothing etc.

Anodized surface is hard, but wear resistance is poor:
- Nanopores and roughness → friction problems
- Need more coatings, e.g. PTFE (Teflon™)
- Or need fillers (e.g. MoS₂, graphene, etc.)

CPST has developed several new treatments for anodized surfaces to increase wear resistance and corrosion inhibition:
- Dry Friction coefficient ~ 0.1; Wear rate can be reduced 1 000 – 10 000 times.
- Field tested in race engines, rope rings, pistons, etc.

Extensive testing of corrosion and bio-corrosion at CPST

Spin-off company „Alanodas“ commercializes „AW-HARD“
- Metalworking and anodization of custom Al parts
• Wear & corrosion should be evaluated at **TRL5 to TRL7**. These problems limit broader utilization of Aluminum.

• Newly treated Aluminum can **replace steel and plastic**:
  - 6xxx, 7xxx and other alloy series: Light weight, easily painted, excellent corrosion resistance
  - **Effectively recyclable** – Al recycling rates exceed 90% in many countries

• The new treatment is a know-how intensive process:
  - Requires qualified anodization skills and equipment
  - Advantage for manufacturers of high-added value items, especially SME
  - E.g. in robotics, photovoltaic panels, laser-based devices, electronic gadgets, etc

• Added-value will benefit mostly EU industries
  - New highly skilled jobs will be created
  - The new treatment is hard to copy by reverse engineering
No existing project consortium on this topics (neither CPST, nor SME „Alanodas“)

- Recent participation as partners in proposal preparation under H2020 calls:
  - H2020-NMBP: Al treatment for resistance to biocorrosion (Stage 1, no funding)
  - H2020-LCE: Light weight energy efficient engine (Stage 2, no funding)
  - H2020-ISIB: Lubricant development (over €0.5M awarded to CPST for 2015-2019)
    - EC contract 635405, project COSMOS

- Looking for a consortium with exposure to high-tech manufacture TRL 5 to TRL 7
  - Lasers, aerospace, robotics, computerized systems
  - Medical devices and biomed applications (good biocompatibility is possible)
  - Development of mobile systems (friction and wear issues)
  - Development of systems in corrosive environment

- Research can also be performed by SME „Alanodas“
  - Prototype manufacture from Al and other metals
  - Coatings using the new treatment
Contact details for project idea

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- https://www.ftmc.lt/material-science-and-corrosion-laboratory
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