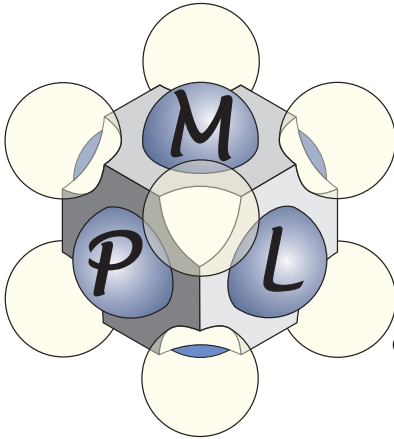
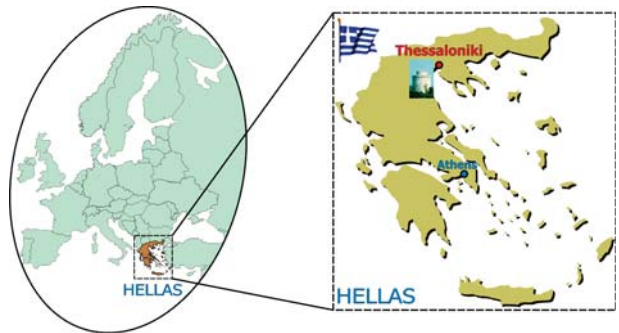


Physical Metallurgy Laboratory - Corrosion Center -



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3rd COMMUNITY SUPPORT FRAMEWORK
OPERATIONAL PROGRAMME



MEASURE 1.2
«NATIONAL QUALITY SYSTEM»
Action 1.2.2 «Certification»

Purpose to serve:

Research & educational activities
 Verifies and certifies corrosion properties of materials
 Regulates the safety levels of new trade materials

Materials:

- Pure metals, coated metals
- Aluminum alloys (2xxx, 5xxx, 7xxx series), Steels
- Composite materials (MMC)

Corrosion forms which are investigated:

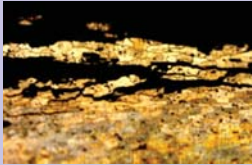
Refers to:

- Industries
- Universities
- Research Institutes and Others ...

Experiments:

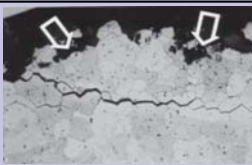
- Simulation of environmental conditions, in which materials are specified for
- Interlaboratory tests
- Check of repeatability and reproducibility of results
- Use of calibrated equipment, in all the experiments

Exfoliation corrosion



- ASTM B117: Practice for Operating Salt Spray (Fog) Apparatus
- EXCO TEST [ASTM G34]: Exfoliation cor. susceptibility in 2xxx and 7xxx ...
- ASSET TEST [ASTM G66]: Visual assessment of exfol. cor. susceptib. of 5xxx ...

Stress corrosion cracking



- ASTM G44: Practice for Exposure of Metals and Alloys by Alternate Immersion in Neutral 3.5 % Sodium Chloride Solution
- ASTM G47: Test Method for Determining Susceptibility to Stress-Corrosion Cracking of 2XXX and 7XXX Aluminum Alloy Products

Pitting corrosion



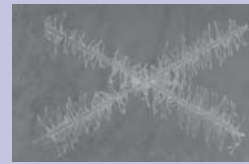
- ASTM B117: Practice for Operating Salt Spray (Fog) Apparatus
- ASTM G44: Practice for Exposure of Metals and Alloys by Alternate Immersion in Neutral 3.5 % Sodium Chloride Solution
- ASTM G46: Guide for Examination and Evaluation of Pitting Corrosion

Intergranular corrosion



- ASTM G67: Test Method for Determining the Susceptibility to Intergranular Corrosion of 5XXX Series Aluminum Alloys by Mass Loss After Exposure to Nitric Acid (NAML Test)
- ASTM G110: Practice for Evaluating Intergranular Corrosion Resistance of Heat Treatable Aluminum Alloys by Immersion in Sodium Chloride + Hydrogen Peroxide Solution

Filiform corrosion



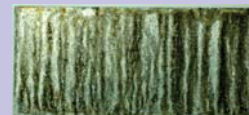
- DIN EN ISO 4623-2: Paints and varnishes-Determination of resistance to filiform corrosion
- ASTM B117: Practice for Operating Salt Spray (Fog) Apparatus

Galvanic corrosion



- ASTM G69: Test Method for Measurement of Corrosion Potentials of Aluminum Alloys
- ASTM G71: Guide for Conducting and Evaluating Galvanic Corrosion Tests in Electrolyte

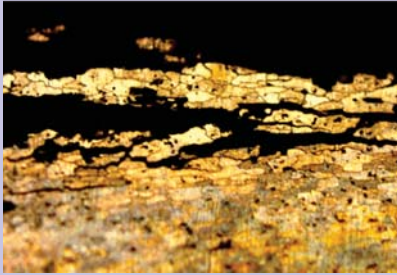
Neutral salt-spray corrosion



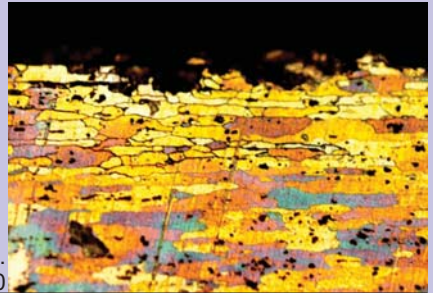
- EN ISO 9227: Corrosion tests in artificial atmospheres - Salt spray tests

TYPICAL CORROSION EXAMPLES

Exfoliation corrosion

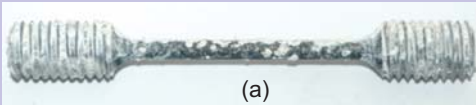


AA2024-T3, after 6 hours in NaCl + KNO₃ + HNO₃ solution. Longitudinal cross section. X20

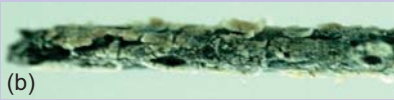


AA2024-T3, after 6 hours in NaCl + KNO₃ + HNO₃ solution. Transverse cross section. X20

Stress corrosion cracking



(a)



(b)

AA7075-T651 after 10 days in 3.5% NaCl solution. (a) unstressed, (b) stressed



(a)



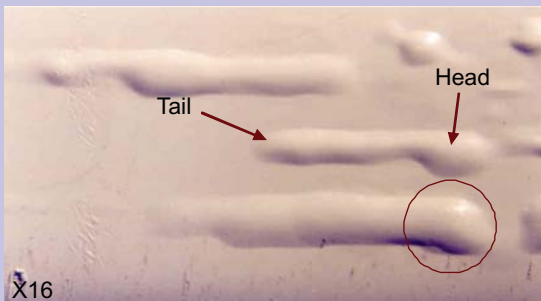
(b)

C-Rings: (a) AA 2007-T4511 (b) AA7075-T651 after 10 days in 3.5% NaCl solution.

Filiform corrosion



X6.3



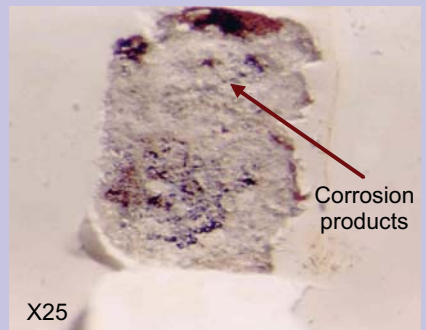
X16

AA6060 after 1500 hrs in 5% NaCl solution

Pitting corrosion



Pits on AA5083-H116 after 24 hrs in NH₄Cl+NH₄NO₃+(NH₄)₂C₄H₄O₆+H₂O₂ solution. X10



X25

Corrosion products

Staff

The staff of PML consists of:

- 3 Academic Personnel
 - Prof. D.N. Tspas (Laboratory Director)
 - Prof. S. Skolianos (Corrosion Center Director)
 - Assist. Prof. N. Michailidis
- 1 Research & teaching assistant
- 2 Technical staff
- 1 Secretary
- 3 Post Doc researchers
- 10 PhD Students
- approx. 10 Students working on diploma thesis

PML offers a post-graduate diploma in the field of:
"Technology and Processes of Advanced Materials"

Main research activities and offered services

Main research activities:

- Surface Engineering and Coatings
- Corrosion and Protection of Materials (accredited by ISO17025)
- Solidification, Casting and Welding,
- Metal Matrix Composite Materials
- Metallic Foams
- Heat Treatments, Influence of microstructure of materials in their properties
- Materials characterization
- Life Cycle Analysis–Materials Recycling–Waste utilisation
- Materials mechanical properties characterization and modelling

Services offered:

- Materials failure and Materials Selection
- Metallographic and microstructural studies
- Corrosion and Corrosion Protection studies
- Heat treatments and Surface Engineering
- Alloy development and casting of materials
- Characterization of mechanical properties and modelling

Automatic abrasive machine



Analytical balance



Precision Saw



SEM with in-situ micro-test



Micro-macro hardness



Alternate immersion set-up



Fluidized bed reactors



Surface Impact tester



Abrasive Cutter



Salt spray cabinet



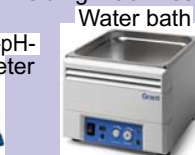
Optical microscopy



Vacuum furnace



Welding machines



Water bath

Induction heating furnace



conductivity-pH-meter



Potentiostat

