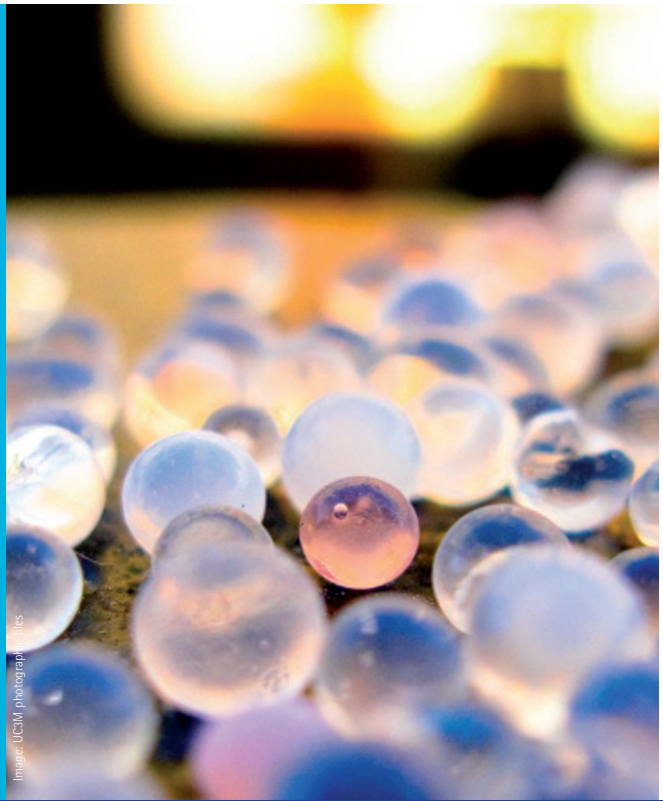
UC3M

RESEARCH GROUPS

GCSM

IN-SERVICE MATERIAL BEHAVIOUR GROUP



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The In-service Material Behaviour Group (GCSM), led by Professor Miguel Ángel Martínez and Professor Francisco Javier Velasco, is a team of multidisciplinary researchers with extensive experience in corrosion, wear, adhesion and surface treatments of materials.

The aim of the group is to offer scientific and technological support to those companies that are facing new technological challenges, especially small and mid-sized enterprises. GCSM can therefore be the R&D department that many companies do not have by offering human and technological resources necessary to overcome said challenges.

GCSM also offers timely solutions to problems by performing assays or tests that the company requires

•LINES OF RESEARCH•

· Surface Treatments and Adhesion: Paints and Adhesives. Solving problems for adhesion in numerous industrial application materials that must be glued and/or painted to form part of structures.

· Failure Analysis and Solution Design for those materials which have had problems throughout their service life.

· Tribology: Friction and Wear. Characterization of wear that a material suffers or may suffer.

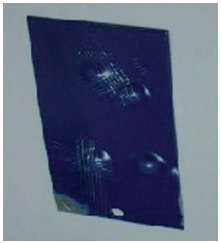
· Corrosion: improved durability of metals and structures with metallic components.

•OUTSTANDING COLLABORATIONS AND R&D&I PROJECTS•

The group maintains collaborations with the following companies: Repsol-YPF, SIKA, Parcisa, CESOL, Desarrollo y Control Tecnológico, Acciona, Henkel, BSH, Roldán.

Some of the most relevant R&D&I projects of the group are:

· "Strategies for Optimizing the Life Cycle of reinforced concrete: Pulsed Cathodic Protection".
Funding Entity: Ministry of Education and Science. Date: 2007-2010



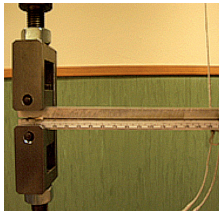
Adhesion and deep cupping tests.

· "Use of Silanes as Environmentally Responsible Solution to Remove Hexavalent Chromium from the Pretreatment of Lacquered Aluminium".
Funding Entity: Ministry of the Environment and Rural and Marine Environs. Date: 2008-2010.

· "New Multipurpose Coating Systems based on novel particle technology for Extreme Environments at High Temperatures (PARTICOAT)".
Funding Entity: European Union. Date: 2008-2012.

· "Behaviour of Corrugated Duplex Stainless Steels of Low Mo Content in Reinforced Concrete Structures Against Corrosion".
Funding Entity: Autonomous Community of Madrid (Comunidad de Madrid). Date: 2009

· "New developments to improve the design of adhesive joints in composite structures".
Funding Entity: Ministry of Industry and Competitivity. Date 2012-2014



DCB test for adhesive bonded aluminium plates.

•INNOVATIVE TECHNOLOGICAL SOLUTIONS•

· Development of surface treatments to improve adhesion of paints, varnishes and adhesives environmentally correct.

· Behaviour of tough elastic adhesives in aggressive media for use thereof for vibration and impact resistant structural connections.

· Corrosion behavior of stainless steels in aggressive conditions.

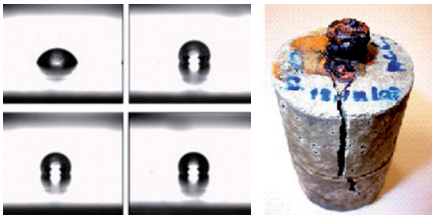
•SCIENTIFIC-TECHNICAL SERVICES•

· Optimization of adhesive joints of dissimilar materials

· Evaluation of service behavior metallic materials: Technical services to perform chemical, electrochemical and microstructural tests.

· Studies of material degradation due to the conditions to which the materials are subjected and finding solutions.

· Tribology studies: friction and wear.



Modification of surface wettability (left). Corroded steel rebar embebbed in mortar (right).

•TECHNOLOGICAL EQUIPMENT•

Microstructural Analysis

· Cutters, fillers and polishers.
· Determination of particle size by laser between 300 and 0.5 μm.
· Reflection optical microscope, Scanning electron microscope and Atomic force microscope.
· Helium pycnometer.

Chemical analysis

· LECO analyzer N/O and C/S.
· X-ray fluorescence spectrometer.

Thermal analysis

· Thermo-mechanical Analysis (TMA) and differential Thermal Analysis (DTA).
· Differential Scanning Calorimeter (DSC) up to 600ºC.
· Dilatometer up to 600ºC with controlled atmosphere.
· Ovens for heat synthesis and treatments.

Corrosion Tests

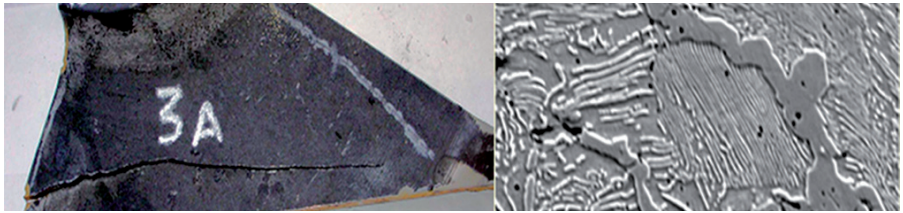
· Oven for high-temperature dry corrosion.
· Potentiostat with frequency analyzer for direct and alternating currents.
· Saline mist chamber, Climate chamber and Kesternich chamber.

Mechanical Tests

· Universal testing machines with load cells from 50 N to 100 kN. Measurement of strain using strain gauge and optical contact. Chamber work at a controlled temperature.
· Jominy device for measuring hardenability.
· Universal Vikers microdurometer.
· Brinell, Rockwell, and Vickers hardness tester.
· Vickers microdurometer.
· High and medium power mills.
· Charpy pendulum for metals and polymers.
· Presses (from 150 Tm, isostatic up to 350 MPa).
· Screen up to 200 μm.
· Pin on disk tribometer.

Paint and adhesive tests

· Atmospheric plasma torch and low pressure plasma chamber.
· IRFT spectroscopy with gradient analysis system.
· Digitized goniometer for measuring surface energy.
· Glossmeter and Colorimeter.
· Determination of polymer flow index.
· Determination of paint melting point .
· Shore durometer with (A and C scales) and esclerometer (A and D scales).
· Buchholz durometer for coatings.
· Solar radiation and flooding aging equipment.
· Standard testing equipment for impact, deep drawing, adhesion and folding over painted sheets.
· Equipment for determining polymer softening temperature.
· Flow meter.
· Thickness indicator.
· Rheometer with temperature, rotation strength and deformation speed control.
· Rheometer-viscometer.
· Roughness meter, planimeter and opisometer.
· Tensiometer by immersion.



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