



SUPERB COVERAGE

Surface modification and coating technologies are widely used to augment product surface functions and improve tooling performance. With the advancement in materials and manufacturing process development, surface technology plays a crucial role in realising new engineering breakthroughs and performance enhancements in various fields.

STG focuses on hybrid tribological composite and multi-functional coatings, surface modification, and nano-structures through materials synthesis, coating design, process innovation, and customisation for a wide range of applications.

The group carries out collaborative research with academic institutions and co-develops processes and products with companies, while providing technology transfer and training to the manufacturing industry.

Core Competencies

Vapour Deposition

- Coating design tailored for applications
- Physical Vapour Deposition (PVD)
- Hard and super hard coatings for wear protection
- Dry-lubricating and anti-stick coatings
- Nanocomposite coatings for high temperature wear and corrosion protection
- Plasma-based surface modification
- Coating and surface characterisation

Electrochemical Process

- Electroplating of metals and alloys
- Anodising of aluminium and magnesium alloys
- Electroless nickel composite coating on metals

- Electroless nickel plating on polymer composites
- Precision electroforming
- Photo-electrochemical precision fabrication

Corrosion Characterisation and Protection

- Materials selection
- Validation and benchmark corrosion mechanisms and failure analysis
- Test methods
- Corrosion protection solutions

Functional Coating

- Particle synthesis and encapsulation
- Sol-gel chemistry formulation for various functional coatings
 - Scratch-resistant and decorative
 - Anti-corrosion
 - Anti-stick
 - Photochromic, infrared shielding
 - Anti-microbial, anti-fouling
 - Easy-to-clean
 - Anti-fingerprint
 - Bioactive/biocompatible
 - Transparent and conductive
- Sol-gel coating processing
- Modelling and optimisation of scratch-resistant films
- Large area roll-to-roll coating processing

Technologies Available for Transfer

Vapour Deposition

- Super tough carbon nanocomposite coating
- Nanocomposite wear-resistant coatings for precision engineering tools
- Dry-lubricating hard coatings

Electrochemical Process

- Magnesium duplex coating
- Stress-free nickel electroforming
- Hard anodising

Functional Coating

- Decorative and protective sol-gel coating for Al-alloys
- Anti-corrosion sol-gel coating for Al and stainless steel
- Slip-resistant coating for glass
- Easy-to-clean coating for metal and polymer
- Hydrophobic coating for textiles
- Hydrophobic or superhydrophilic coating for polymers
- Anti-microbial anti-fouling coatings
- Solar responsive coatings

Others

- Automatic synthesis of silver nanowires and nanoparticles, and other nanomaterials

Target Industries

- Aerospace • Alternative Energy • Automotive
- Biomedical and Healthcare • Construction
- Marine • Oil & Gas • Optical and Electronics
- Precision Engineering

Major Facilities

Vapour Deposition

- Physical Vapour Deposition (magnetron sputtering, cathode arc, thermal and E-beam evaporation)
- Integrated vacuum processing and glove box system
- Plasma cleaning system
- Pulsed plasma polymerisation system

Electrochemical Process

- Electrochemical deposition and etching facilities
- High-low power anodising systems

Functional Coating

- Autoclave for hydrothermal reaction
- Chemical reactor for nanoparticle synthesis
- Sol-gel coating systems
- Ultraviolet curing facilities
- Microwave synthesizer

Corrosion Characterisation and Protection

- Corrosion characterisation techniques (Electrochemical Impedance Spectrometer, Scanning Vibrating Electrode Technique, Cyclic Corrosion Test) and methodologies
- Weathering test facility

Industry Partners

- Altimate EnviroCare Services
- BD (Singapore)
- BeCe Interconnect Solutions
- CEL Coatings Industries
- Ching Yi Crafting
- Clear Lab
- Cooper Cameron Singapore
- Essilor Singapore
- Feinmetall Singapore
- Haruna
- Hewlett Packard Singapore
- HT Glass
- jMedtech
- JSB Tech
- Nano Eco Science (Singapore)
- Nico Steel Solutions
- Omni Mold
- Philips Consumer Lifestyle
- PIE Electroplating
- PJI Contract
- Pmax One Technologies
- Polycore
- Redwood Interior
- Rolls-Royce
- Samko Timber
- SCA Specialty Chemical
- Schlumberger
- Shimano Singapore
- Singapore Safety Glass
- SMC Industrial
- Solvay Group Rhodia Asia-Pacific
- ST Kinetics
- Stamping Industries
- Star Controls Engineering Co
- Sterling Impreglon Asia
- Sunningdale Tech
- Sunstar Engineering
- Tri-Star Industries
- Union Inks & Graphics
- Unisteel Technology
- Wangi Industrial

Research Partners

- Institute of Bioengineering and Nanotechnology (Singapore)
- Institute of Charles Gerhardt (France)
- Institute of Chemical and Engineering Sciences (Singapore)
- Institute of High Performance Computing (Singapore)
- Institute of Materials Research and Engineering (Singapore)
- Koszalin University of Technology (Poland)
- Manchester University (UK)
- Nanyang Technological University (Singapore)
- National Institute of Advanced Industrial Science and Technology (Japan)
- National University of Singapore (Singapore)
- Swerea KIMAB (Sweden)
- Technical University of Munich (Germany)
- Tohoku University (Japan)
- University of Cambridge (UK)
- University of Oxford (UK)

