Our Research Centres and Joint Labs – Research with a Purpose

Our innovative technologies and R&D are made applicable to industry through our research centres and joint laboratories, demonstrating, testing, and prototyping these technologies in collaboration with our research and industry partners.

Our laboratories are equipped with state-of-the-art equipment and have been instrumental in pushing the boundaries of research in various fields. Our researchers collaborate with other research institutions, universities, public bodies, and a wide spectrum of industries, both globally and locally. The focus of our research is on the development of innovative technologies and solutions that address real-world challenges.

Our Research Centres

- **Aerospace & Automotive**
  - R&D in materials such as composites, metals, and their processes for manufacturing and transportation.
  - Development of novel lightweight and high-strength metal alloys and metal composites, micromachining, and new processing technologies.

- **Energy**
  - Support for the industry includes material technologies such as composite materials for manufacturing internal and external energy applications, inorganic electrode materials for high capacity energy storage, unique materials for deep water marine and offshore engineering, and innovative materials developments.
  - R&D projects also cover synthetic and nonlinear optical materials, and catalytic materials.

- **Bioelectronics**
  - Research in this industry includes optional growth of component semiconductors, and development of organic semiconductors for various electronic devices. Development efforts focus on organic thin-film transistors, quantum dots, heterostructures, and organic optoelectronics.

- **MedTech**
  - Research in this industry focuses on biomaterials and medical devices, functional surfaces, nano-imprint technology, and microfluidic design and fabrication technology.

- **Consumer Care**
  - Research in this industry includes polymer science for consumer care, research and development of packaging materials.

- **Pharmaceutical & Food**
  - Research in this industry includes asymmetric catalysis and development of packaging materials for the preservation of food freshness and intelligent sensing.

- **Green and Sustainable Materials**
  - Research in this industry includes renewable energy, smart grids, biomass, and consumer technologies, with a focus on sustainable materials.

- **Industrial Coating and Packaging**
  - Research in this industry focuses on energy harvesting and storage, advanced materials, and new manufacturing techniques.

- **Materials Research**
  - Research in this industry includes materials analysis, characterisation, and synthesis.

- **Where Innovation Meets Enterprise**
  - IMRE is a research institute of A*STAR, the Agency for Science, Technology, and Research (formerly known as the Agency for Science, Technology and Research (A*STAR)).

IMRE is an elementary component of our material technologies for anchoring the R&D needs of industries in Singapore. The industry sectors that IMRE collaborates with include:

- **Aerospace & Automotive**
- **Energy**
- **Bioelectronics**
- **MedTech**
- **Consumer Care**
- **Pharmaceutical & Food**
- **Green and Sustainable Materials**
- **Industrial Coating and Packaging**

IMRE’s extensive portfolio of material technologies includes industry collaboration for anchoring the R&D needs of industries in Singapore. The industry sectors that IMRE collaborates with include:

- **Aerospace & Automotive**
- **Energy**
- **Bioelectronics**
- **MedTech**
- **Consumer Care**
- **Pharmaceutical & Food**
- **Green and Sustainable Materials**
- **Industrial Coating and Packaging**

Materials Research and Engineering (IMRE)

IMRE is a research institute of the Agency for Science, Technology, and Research (A*STAR). We aim to conduct research that is relevant to industry and to promote the commercialisation of our research findings. Our research focus is on the development of high-performance materials and technologies, with an emphasis on innovation and sustainability.

Our researchers collaborate with other research institutes, universities, and public bodies, both locally and internationally, to address real-world challenges. We focus on the development of new materials and technologies that can be applied to various industries, including aerospace, automotive, energy, and consumer care.

Our materials research and engineering activities include:

- **Aerospace & Automotive**
  - Focus on lightweight and high-strength materials for aerospace applications.

- **Energy**
  - Development of renewable energy technologies, including solar cells, batteries, and energy storage solutions.

- **Bioelectronics**
  - Research on biocompatible materials and devices for medical applications.

- **MedTech**
  - Development of novel medical devices and materials for healthcare.

- **Consumer Care**
  - Focus on materials for personal care products and consumer goods.

- **Pharmaceutical & Food**
  - Research on materials for drug delivery and food packaging.

- **Green and Sustainable Materials**
  - Development of sustainable materials for environmental applications.

- **Industrial Coating and Packaging**
  - Research on materials for industrial applications, including coatings and packaging solutions.

Where Innovation Meets Enterprise

Our research focuses on the development of high-performance materials and technologies that can be applied to various industries. We collaborate with other research institutes, universities, and public bodies to address real-world challenges. Our research findings are relevant to industry and contribute to the commercialisation of our research findings.
Analysis & Characterisation

Research is focused on materials design and growth in three clusters and for various applications.

- **Fermic materials**: Ferromagnetic and ferroelectric materials, including single-layer free-floating ferroelectric and piezoelectric materials, for sensors, actuators, and energy transducers.
- **Metals and metal-alloys**: Functional metal-oxide - e.g., transparent conducting oxides, functional metal-oxides (e.g., transparent conducting oxides), such as energy efficient window ITO, novel inorganic semiconductors for PV application, and as energy efficient window ITO.
- **Semiconductor materials** - Growth and processing of III-N and III-V semiconductor thin films, nanostructures for application in various electronic and opto-electronic devices such as energy efficient white LEDs; novel inorganic semiconductors for PV application; films, nanostructures for application in various electronic and opto-electronic devices.

Applications:

- **Innovative material-critical sensors and transducers** - Explores signal and energy conversion mechanisms in smart materials and nanostructures, and spearheads research in harvesting, storage, and devices.
- **Heterogeneous catalysts**: Micro, meso and macroporous materials and structures, including the interaction with surfaces and rheology performance for developing better consumer care products.
- **Ferroelectric and magnetic materials**: Including functional and functionalized materials for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Recent conceptual polymers**: Unique encapsulation systems for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Functional Polymers**: Unique and energy-efficient technologies that can be applied to healthcare and diagnosis, precision engineering, consumer electronics, intelligent monitoring systems and in harsh environments (e.g. marine and offshore).
- **Composite armour**: Micro, meso and macroporous materials and structures, including the interaction with surfaces and rheology performance for developing better consumer care products.
- **Microstructured materials**: Functional and functionalized materials for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Fluorescence and THz spectroscopy**: Nanostructured materials, including nanospheres and nanoshells for use in consumer care.
- **Hydrogels and other materials**: Functional and functionalized materials for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Polymer chemistry, properties and relationships studies**: Unique and energy-efficient technologies that can be applied to healthcare and diagnosis, precision engineering, consumer electronics, intelligent monitoring systems and in harsh environments (e.g. marine and offshore).

Our R&D – What We Can Do for You

**Top-down surface patterning technique**

- Nanoscale device design and system integration - Nanoelectromechanics, supercomputers and lab-on-chip devices.
- **Top-down surface patterning technique** - Nanopatterning lithography, shadow lithography and electroplating.
- **New patterning and fabrication techniques** that are scalable and can be integrated into functional systems and devices.
- **Bottom-up surface patterning technique** - Atomic layer deposition, self-assembly, and high performance electromechanical actuators and transducers.
- **Nanostructured materials**: Functional and functionalized materials for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Fluorescence and THz spectroscopy**: Nanostructured materials, including nanospheres and nanoshells for use in consumer care.
- **Hydrogels and other materials**: Functional and functionalized materials for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Polymer chemistry, properties and relationships studies**: Unique and energy-efficient technologies that can be applied to healthcare and diagnosis, precision engineering, consumer electronics, intelligent monitoring systems and in harsh environments (e.g. marine and offshore).

Patterning & Fabrication

- **Nanotechnology**: Nanoscale device design and system integration - Nanoelectromechanics, supercomputers and lab-on-chip devices.
- **Top-down surface patterning technique** - Nanopatterning lithography, shadow lithography and electroplating.
- **New patterning and fabrication techniques** that are scalable and can be integrated into functional systems and devices.
- **Bottom-up surface patterning technique** - Atomic layer deposition, self-assembly, and high performance electromechanical actuators and transducers.

Synthesis & Integration

- **Structure-property correlations and integrated materials research** studies to establish design principles for material and process innovations.
- **Applications-specific electronic materials**
- **Engineered nanostructures and nanostructures**
- **Functional polymers**
- **Molecular materials**

Applications:

- **Consumer care products**, cosmetics, biomedical and healthcare, bio-imaging and diagnostic, catalysis, energy storage and solar energy harvesting, next generation organic electronics, battery, coating, protective and structural components for environmental extremes, among others.

SEREC Nano Fabrication, Processing and Characterisation

The SEREC facility offers a variety of services to support research facilities in Nanofabrication and Characterisation, enabling organisations to access a range of equipment and expertise. The facility is part of the European X-FEL network, providing access to state-of-the-art X-ray and neutron facilities.

Applications:

- **Functional materials**: Functional and functionalized materials for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Recent conceptual polymers**: Unique encapsulation systems for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Microstructured materials**: Functional and functionalized materials for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Fluorescence and THz spectroscopy**: Nanostructured materials, including nanospheres and nanoshells for use in consumer care.
- **Hydrogels and other materials**: Functional and functionalized materials for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Polymer chemistry, properties and relationships studies**: Unique and energy-efficient technologies that can be applied to healthcare and diagnosis, precision engineering, consumer electronics, intelligent monitoring systems and in harsh environments (e.g. marine and offshore).

Our Programmes – Developing Commercially-relevant Research

**Consumer Care Technology Programme**

- **Polymer chemistry, properties and relationships studies** to understand the interaction with surfaces and rheology performance for developing better consumer care products.
- **Cost effective formulations and synthetic biology technology** that reduce the use of petroleum-based chemicals and help in the development of greener materials for consumer care.
- **Nanostructured materials**: Functional and functionalized materials for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.

Applications:

- **New conceptual polymers**: Unique encapsulation systems for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Recent conceptual polymers**: Unique encapsulation systems for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Microstructured materials**: Functional and functionalized materials for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Fluorescence and THz spectroscopy**: Nanostructured materials, including nanospheres and nanoshells for use in consumer care.
- **Hydrogels and other materials**: Functional and functionalized materials for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Polymer chemistry, properties and relationships studies**: Unique and energy-efficient technologies that can be applied to healthcare and diagnosis, precision engineering, consumer electronics, intelligent monitoring systems and in harsh environments (e.g. marine and offshore).

Applications:

- **Fluorescence and THz spectroscopy**: Nanostructured materials, including nanospheres and nanoshells for use in consumer care.
- **Polymer chemistry, properties and relationships studies**: Unique and energy-efficient technologies that can be applied to healthcare and diagnosis, precision engineering, consumer electronics, intelligent monitoring systems and in harsh environments (e.g. marine and offshore).

Our interdisciplinary research is harnessed to form various research programmes that have high application potential in relevant industry niches. Some examples include:

**Sensors & Transducers Programme**

- **Innovative material-critical sensors and transducers** - Explores signal and energy conversion mechanisms in smart materials and nanostructures, and spearheads research in material-critical sensors and transducers with unique features and improved performance.

- **Unique samples and devices**: Functional and functionalized materials for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Recent conceptual polymers**: Unique encapsulation systems for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Hydrogels and other materials**: Functional and functionalized materials for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Polymer chemistry, properties and relationships studies**: Unique and energy-efficient technologies that can be applied to healthcare and diagnosis, precision engineering, consumer electronics, intelligent monitoring systems and in harsh environments (e.g. marine and offshore).

Applications:

- **Microstructured materials**: Functional and functionalized materials for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Fluorescence and THz spectroscopy**: Nanostructured materials, including nanospheres and nanoshells for use in consumer care.
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Applications:

- **Microstructured materials**: Functional and functionalized materials for the storage, specific triggering and sustained release of fragrances, flavors, scents and for taste masking.
- **Fluorescence and THz spectroscopy**: Nanostructured materials, including nanospheres and nanoshells for use in consumer care.
- **Polymer chemistry, properties and relationships studies**: Unique and energy-efficient technologies that can be applied to healthcare and diagnosis, precision engineering, consumer electronics, intelligent monitoring systems and in harsh environments (e.g. marine and offshore).

Applications:
Synthesis & Integration

Structure-property correlations and integrated materials technologies studies to establish design principles for material and process innovations.

- Application-specific electronic materials
- Engineered nanocomposites and nanostructures
- Functional polymers
- Molecular materials

**Applications:**
- Consumer care products, cosmetics, biomedical, healthcare, bio-imaging and diagnostic, catalysis, renewable energy and solar energy harnessing, next generation organic electronics, battery, coating, protective and structural components for environmental extremes, among others.

**SERC Nano Fabrication, Processing and Characterisation (SnFPC)**

The SnFPC facility aims to make A*STAR SERC’s extensive research facilities in Nanofabrication and Characterisation techniques accessible to all researchers. The facility at IMRE forms the hub of an A*STAR-wide network providing easy access to a range of research equipment and Characterisation techniques accessible to all researchers. The facility at IMRE forms the hub of an A*STAR-wide network providing easy access to a range of research equipment and Characterisation techniques accessible to all researchers.

- Advanced in-situ probes - Intermolecular catalysis, photophysical, catalysis dynamics, reaction probes, charge transport, in-situ electron microscopy, study of structural and optical anisotropy.
- Advanced inspection and detection technology - Focused 5keV, e.g., LEAP, the electron microscopy and imaging platform, electron spectroscopy, electron holography, and single particle analysis.
- Atom technology - Atom manipulation, atomic scale deposition, molecular level bonds, molecular gates, ballistic electron emission microscopy, atomically precise nanowires, and scanning tunneling microscopy.
- Biographics and nanographics - Biological imaging, cell visualization and imaging and geometric nanotopography, single molecule sensor, spectroscopy and nanopatterning, biosensor development, and true material science.
- Green electronics and photonics characterization and development - Optical and tribology and device properties, characterization of photovoltaics, solar cells, LED, and semiconductors.
- Imaging and analysis - Scanning probe microscopy, chemical and structural analysis, and mechanical and optical probing.
- Heterogeneous catalyst, photocatalyst, catalyst dynamics, and fluorescent and THz imaging and sensing.
- Fluorescence and Titin in smart materials and nanomaterials, including nanosensors as fluorescent probes for imaging and sensing. The spectroscopy and THz wave generation from nanostructured smart materials.
- Innovative material-critical sensors and transducers, including sensors with wireless and/or battery-less features, fluorescent and THz imaging and sensing, and cigarette filters.

Our Programmes – Developing Commercially-relevant Research

**Consumer Care Technology Programme**

The science of polymers, colloids, interfaces and biology to create new materials and formulations for consumer care products. From moisturizers to perfumes, from moisturizers to perfumes.

- Polymer chemistry, properties and relationships studies to understand the interaction with surfaces and rheology performance for developing better consumer care products.
- Cost effective formulations and synthetic biology technology that reduce the use of petroleum and lead to the development of green materials for consumer care.
- New conceptual polymers for signal-responsive and antimicrobial applications.

**Applications:**
- New polymers, formulations and more sustainable materials for cosmetics, health and bodycare products.

**Encapsulation via Self-assembly**

- Unique encapsulation systems for the storage, specific triggering and sustained release of fragrances, flavours, ‘nose’ and taste for masking.
- Time and site specific release of active agents, e.g., pH-, salt- or enzyme-sensitive, tunable and light-sensing systems for application in laundry and dishwashing aids, anti-perspirants and sunblock creams.
- Protecting sensitive active ingredients by encapsulating in water-sensitive compounds, thermo-sensitive compounds and probiotics for use in biodegradable, food stuff and dietary supplements.

**Applications:**
- Encapsulation and controlled release systems for use in perfumes, fabric softeners, food and beverage, and cigarette filters.

**Colloids Science & Biology**

- Colloidal structures, properties and relationships studies to understand complex colloidal structures and effects on skin and long-term release.
- **Skin biology, light and pigment effects studies** to understand skin biology via model systems and develop skin care products using light, pigment and updated formulations.

**Applications:**
- Fundamental understanding that enhances and guides the design of better consumer care products.

**Sensors & Transducers Programme**

- Explores signal and energy conversion mechanisms in smart materials and nanotechnology, and spearheads research in material-critical sensors and transducers with unique features and improved performance.

**Applications:**
- Unique and energy-efficient technologies that can be applied to healthcare and diagnosis, precision engineering, consumer electronics, intelligent monitoring systems and in harsh environments (e.g. marine and offshore).

**Programme’s successes:**
- Successful adoption of over 100,000 dpi resolution for the creation of highly-detailed images at resolutions of under 200 nanometres.
- Successful development of a new class of flexible and soft composite armour invented by IMRE's Dr Davy Cheong won the 'Coolest Innovation' award (Techventure 2011) and Demo Guru award (DEMO Asia 2012).

**Composite armour**

Researchers from IMRE had developed an innovative method for creating sharp, flexible and soft composite armour invented by IMRE's Dr Davy Cheong won the 'Coolest Innovation' award (Techventure 2011) and Demo Guru award (DEMO Asia 2012). The science of polymers, colloids, interfaces and biology to create new materials and formulations for consumer care products. From moisturizers to perfumes.

**Biology & Nanomaterials**

- Concepts and applications of a multitude of electronic, biological, catalysis, semiconductor materials and devices.
- Modeling, simulation, and analysis of a multitude of electronic, biological, catalysis, semiconductor materials and devices.
- Advanced in-situ probes - Intermolecular catalysis, photophysical, catalysis dynamics, reaction probes, charge transport, in-situ electron microscopy, study of structural and optical anisotropy.
- Advanced inspection and detection technology - Focused 5keV, e.g., LEAP, the electron microscopy and imaging platform, electron spectroscopy, electron holography, and single particle analysis.
- Atom technology - Atom manipulation, atomic scale deposition, molecular level bonds, molecular gates, ballistic electron emission microscopy, atomically precise nanowires, and scanning tunneling microscopy.
- Biographics and nanographics - Biological imaging, cell visualization and imaging and geometric nanotopography, single molecule sensor, spectroscopy and nanopatterning, biosensor development, and true material science.
- Green electronics and photonics characterization and development - Optical and tribology and device properties, characterization of photovoltaics, solar cells, LED, and semiconductors.
- Imaging and analysis - Scanning probe microscopy, chemical and structural analysis, and mechanical and optical probing.
- Heterogeneous catalyst, photocatalyst, catalyst dynamics, and fluorescent and THz imaging and sensing.
- Fluorescence and Titin in smart materials and nanomaterials, including nanosensors as fluorescent probes for imaging and sensing. The spectroscopy and THz wave generation from nanostructured smart materials.
- Innovative material-critical sensors and transducers, including sensors with wireless and/or battery-less features, fluorescent and THz imaging and sensing, and high performance electronics and thermal actuators and transducers.

**Applications:**
- Unique and energy-efficient technologies that can be applied to healthcare and diagnosis, precision engineering, consumer electronics, intelligent monitoring systems and in harsh environments (e.g. marine and offshore).
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Synthesis & Integration

Structure-property correlations and integrated materials studies to establish design principles for material and process innovations.

- Application-specific electronic materials
- Engineered nanocomposites and nanostructures
- Functional polymers
- Molecular materials

Applications:
- Consumer care products, cosmetics, biomedical and healthcare, bio-imaging and diagnostic, catalysis, renewable energy and solar energy harvesting, next generation organic electronics, battery, coating, protective and structural components for environmental extremes, among others.

SERC nano Fabrication, Processing and Characterisation

The SERC facility aims to build a multi-disciplinary research facility in Nanofabrication and Characterisation techniques accessible to all researchers. The lab at SERC forms the hub of an A*STAR-wide network providing easy access to a range of research equipment and expertise on a variety of techniques. SERC includes a 700 sqm purpose-built clean room for research work on a variety of materials.

SERC offers an extensive range of Nanofabrication and Characterisation services and training on the use of the equipment. Staff are highly trained in the use of the equipment and are encouraged to use the tools on their own. Access to the equipment is on a first-come first-served basis, subject to availability.

For more information on SERC:
http://www.mms.a-star.edu.sg/SERC

Design & Growth

Research is focused on materials design and growth in three clusters and for various applications.

- Ferroic materials: Ferroelectric and ferromagnetic materials, including functional ferromagnetic and piezoelectric materials, for sensors, actuators, and energy transducers.
- Metamaterials and plasmonics: Functional optical design elements, including nanostructured materials, for photonic devices, nanoelectronic materials for nano-CMOS, and hard coatings.
- Semiconductor materials: Growth and processing of III-V and II- VI semiconductor thin films, nanostructures for applications in various electronic and opto-electronic devices such as energy efficient white LEDs, novel inorganic semiconductors for PV applications, and nanoelectronic materials for CMOS.

Applications: Materials for green energy technology such as energy harvesting and storage, solar energy conversion and energy efficiency.

Patterning & Fabrication

Patterning and fabrication techniques that are scalable and can be integrated into functional devices are explored.

- Bottom-up surface patterning technique: Accurate admix templates, self-assembly of supramolecular, nanostructured, and programmable membranes.
- Nanoscale device design and system integration: Nanoelectronics, supercomputers and logic chips.

Applications: New chemical-free and unique surface technologies for electronics, optoelectronics, photonics, storage media, chemical and biomedical devices.

Our Programmes – Developing Commercially-relevant Research

Our interdisciplinary research is harnessed to form various research programmes that have high application potential in relevant industry niches. Some examples include:

Consumer Care Technology Programme

The science of polymers, colloids, interfaces and biology to create new materials and formulations for consumer care products.

- Polymer chemistry, properties and relationships studies to understand the structure and performance of polymers for consumer care products.
- Cost effective formulations and synthetic biology technology that reduces the use of petroleum based chemicals in the development of greener materials for consumer care.

Sensors & Transducers Programme

The science of polymers, colloids, interfaces and biology to create new materials and formulations for consumer care products.

- Fluorimetry and fluorophores for the storage, specific triggering and sustained release of fragrances, flavours, scents and for taste masking.
- Time and space specific release capsules based on pH, salt, or enzyme triggers, tunable and light-sensitive systems for application in laundry and dishwashing aids, anti-pesticides and toothpastes.
- Protecting sensitive active ingredients by encapsulating with water-sensitive compounds, thermo-sensitive compounds and probiotics for use in biodegradable, food stuff and dietary supplements.

Applications: Encapsulation and controlled release systems for cosmetic, food, softeners, food, beverage and cigarette filters.

Colloids Science & Biology

- Colloid structures, properties and relationships studies to understand complex colloidal structures and effects on skin and cosmetic properties.
- Skin biology, light and pigment effects studies to understand skin biodistribution via model systems and develop skin care products using high, pigmented and fluorescent formulations.

Applications: Fundamental understanding that enhances and guides the design of better consumer care products.

Sensors and Transducers Programme

- Smart materials, currently focusing on high performance ferroelectric and piezoelectric materials, piezoelectric microstructure, electromechanical design, and high frequency acoustic technologies.
- Fluorescence and TiO2 in smart materials and Asterix remote control in nanostructured materials, including nanogenerators as fluorophore probes for imaging and sensing, TiO2 spectroscopy and TiO2 self-generation from nanostructured smart materials.
- Innovative material-critical sensors and transducers, including sensors with wireless and/or battery-less features.

Applications: Unique and energy-efficient technologies that can be applied to healthcare and diagnosis, precision engineering, consumer electronics, intelligent monitoring systems and in harsh environments (e.g. marine and offshore).

Composite Armour

- Flexible and soft composite armour invented by IMRE’s Dr. Davy Cheong won the One cool armour award at the ASM International’s Materials Show 2011.

Applications: Composite armour for the military and law enforcement sector for reducing body damage caused by creating tiny temperature colour changes at 125,000 dots per inch pixels, using metal-lead free materials, soft for body to use.
Dr Joel Yang was awarded the Young Scientist Award (YSA) 2012 at the annual President's Science and Technology Awards ceremony which honours Singapore's best and brightest scientific talents. Jaslyn's research focuses on turning ordinary material into functional surfaces or ones with uniquely engineered properties. Her materials science work in nanoimprinting. Jaslyn's research focuses on turning ordinary material into functional surfaces or ones with uniquely engineered properties. Her materials science work in nanoimprinting includes imprinting technologies for the construction of micro- and nano-patterned materials, which are used in a variety of applications ranging from electronics to drug delivery systems. Jaslyn has developed innovative methods for the fabrication of nanoscale electronic devices and has made significant contributions to the field of nanotechnology. Her research has been recognised with numerous awards and distinctions, including the Young Scientist Award (YSA) 2012. Dr Joel Yang's work has led to the development of new materials for electronic device fabrication and has contributed to the advancement of nanotechnology in Singapore. His research has been funded by prestigious grants, and he has published extensively in leading scientific journals.
Our Research Centres and Joint Labs – Research with a Purpose

Our innovative technologies and R&D are made applicable to industry through our research centres and joint industry partners.

Aerospace & Automotive
R&D in materials such as polymers, metal alloys, and their processes for manufacturing and modifications. IMRE is also developing novel lightweight and high-strength metal alloys and metal composites (e.g., metal matrix composites), in addition to our current research activities related to nanocomposites, surface coatings, etc. for extreme conditions.

Energy
R&D for this industry includes material technologies such as composite materials for manufacturing high speed railway applications, innovative electrode materials for high capacity energy storage, unique materials for deep water marine systems hosting innovative and innovative materials developments in batteries. R&D will also cover photovoltaic devices, including bifacial modules and novel materials to solve the energy transition and storage issues.

Electronics
R&D for this industry includes the enhancement of functional composite materials, and development of functional nanoelectronics for various electronic devices. Development of functional composite materials (e.g., plastics), semiconductors and ferroelectric materials as well as high performance, large area, high temperature, high stress and pressure resistant materials. These often mimic natural surfaces, for example the structures found on lotus leaves so that the new materials are imbued with its waterproofing properties. Nanoimprint technology has evolved from being a potential next-generation lithography technology for the semiconductor industry to a platform process technology that is applicable to a wide range of industry sectors that IMRE collaborates with.

Health and wellness applications
IMRE scientists have used nanoimprint technology to make uniform, nanometer-scale patterns on materials or functional surfaces. These often mimic natural surfaces, for example the structures found on lotus leaves so that the new materials are imbued with its waterproofing properties. Nanoimprint technology has evolved from being a potential next-generation lithography technology for the semiconductor industry to a platform process technology that is applicable to a wide range of industry sectors that IMRE collaborates with.

Materials
Where Innovation Meets Enterprise

Research Link, Singapore 117602 • Tel +65 6874 8111 • Fax +65 6872 0785 • enquiry@imre.a-star.edu.sg

IMRE's green and sustainable materials are developed based on new environmentally responsive, eco-friendly technologies. These include phase change materials, lightweight and smart coating materials for green buildings as well as bio-renewable materials for bio-based plastics and personal care products.

Industrial Consortium On Nanoimprint (ICON)
www.imre.a-star.edu.sg/ICON

ICON encourages companies to adopt versatile, industry-ready nanoimprinting technology that allows new chemical and additive-free products for the market. This nanoimprinting technology makes it possible to create specific patterns at a scale that produce unique properties. These often mimic natural surfaces, for example the structures found on lotus leaves so that the new materials are imbued with its waterproofing properties. Nanoimprint technology has evolved from being a potential next-generation lithography technology for the semiconductor industry to a platform process technology that is applicable to a wide range of industry sectors that IMRE collaborates with.

Industrial Coating and Packaging (ICAP) Consortium
www.imre.a-star.edu.sg/ICAP

The ICAP Consortium is a collaboration between IMRE and the Packaging Industry to develop innovative packaging and coating solutions.

Remarkable Researchers

Dr Jiulin Lin
Dr Jiulin Lin was awarded the Young Scientist Award (YSA) 2012 by the National Academy of Engineering, Singapore. Dr Jiulin Lin’s research focus is on functional nanomaterials for nanoelectronics, including nanocrystals and their applications to create novel nanoelectronic devices and systems. Dr Jiulin Lin was also one of the first scientists to successfully use nanoimprinting technology to create uniform, nanometer-scale patterns on materials or functional surfaces, which are often mimicked by natural surfaces, for example the structures found on lotus leaves so that the new materials are imbued with its waterproofing properties. Nanoimprint technology has evolved from being a potential next-generation lithography technology for the semiconductor industry to a platform process technology that is applicable to a wide range of industry sectors that IMRE collaborates with.

Dr Jin-Lee Yoo
Dr Jin-Lee Yoo was awarded the 2012 Dow Global Women in Science (DGWS) National Fellowship for his research on functional nanomaterials for nanoelectronics, focusing on functional nanomaterials for nanoelectronics, including nanocrystals and their applications to create novel nanoelectronic devices and systems.

Dr Jin-Lee Yoo's research focuses on functional nanomaterials for nanoelectronics, including nanocrystals and their applications to create novel nanoelectronic devices and systems.