Singapore consortium learns from nature to produce new chemical-free, anti-bacteria plastic ‘skins’

5 new US, European and Japanese companies join A*STAR’s Industrial Consortium On Nanoimprint (ICON) to engineer marine life-inspired antimicrobial surfaces for use on ships, lenses and even medical devices. Technology will also be seeded at 3 participating local polytechnics.

1. Taking a leaf from animals like dolphins and pilot whales that are known to have anti-fouling skins, researchers from A*STAR’s Industrial Consortium On Nanoimprint (ICON) are using nanotechnology to create synthetic, chemical-free, anti-bacterial surfaces. The surfaces can reduce infections caused by pathogens such as S. aureus and E. coli and can be used on common plastics, medical devices, lenses and even ship hulls. Conventional methods for preventing bacterial surface attachment may use potentially harmful metal ions, nanoparticles, chemicals or UV-radiation.

2. Nanoimprint technology, a form of nanotechnology, is a simple technique that has been developed by IMRE to make complex nanometer-sized patterns on surfaces to mimic the texture of natural surfaces. This gives the engineered material ‘natural’ properties such as luminescence, adhesiveness, water-proofing and anti-reflectivity.

3. The anti-bacterial surfaces research is ICON’s second industry-themed project and will involve A*STAR’s Institute of Materials Research and Engineering (IMRE) and companies like Nypro Inc (USA), Hoya Corporation (Japan), Advanced Technologies and Regenerative Medicine, LLC (ATRM) (USA), NIL Technology ApS (Denmark) and Akzo Nobel (UK). This is also the first time that 3 local polytechnics, namely Singapore Polytechnic, Temasek Polytechnic and Ngee Ann Polytechnic are working with the consortium partners, under a special arrangement.

4. “With millions of years of experience behind her, nature has produced some of the most rugged, adaptable life forms. Who better to learn engineering from than Mother Nature?”, said Dr Low Hong Yee, IMRE’s Director for Research and Innovation and head of the consortium. She added that the anti-microbial surfaces project will demonstrate the versatility of nanoimprinting technology and its benefits to a wide range of industries.

5. “The strong support given by industry to this second project and to the consortium is a resounding seal of approval of the research, the talent expertise, the technology and its real-world applications”, said Prof Andy Hor, Executive Director of IMRE.

6. Dr Raj Thampuran, A*STAR Science and Engineering Research Council’s (SERC) Executive Director added, “Working closely with companies ensures that our R&D and expertise is translated at the earliest possible time and contributes value to the economy. Borrowing intimately from characteristics in nature represents some of the most frontier and innovative ideas in science and engineering. I am pleased that IMRE’s research will help companies challenge difficult engineering problems”.

7. “ICON and nanoimprint research gives our own R&D an added dimension and provides us with alternative options on how our existing technology can be applied”, said Mr Steve Ferriday, Technical Manager, Worldwide Marine Foul Release, International Paint Ltd (UK), which is part of Akzo Nobel, the world’s largest global paints and coatings company. The company recently established their worldwide marine research laboratory in Singapore and is keen to explore how these surfaces might work in a marine environment.
8. “Chemical additives in biomedical devices can adversely affect different users in different ways. The anti-microbial surfaces derived from nanoimprint technology without the need for additional chemicals and coatings may offer us an alternative solution to this issue”, said Mr Tsuyoshi Watanabe, General Manager, R&D Center of Hoya Corporation, a Japanese-based company dealing in advanced electronics and optics technologies. The company has a plant in Singapore producing implanted lenses for the eye.

9. “Nypro is excited to be a part of this second project. Our participation in such a world class collaborative programme gives Nypro a competitive advantage in bringing innovation to our customers”, commented Mr Michael McGee, Director of Technology from Nypro Inc., a leading global solutions provider in the field of manufactured precision plastic products.

10. "This collaboration will enable the R&D partners to leverage on their areas of expertise to investigate how bacteria attach to specially designed surfaces of different materials. The industrial applications are tremendous and Ngee Ann Polytechnic is excited to be part of the team. Our student interns from various courses at the School of Life Sciences & Chemical Technology will also benefit from working on projects under the supervision of top researchers," said Mrs Tang-Lim Guek Im, Senior Director for Technology Collaboration at Ngee Ann Polytechnic, Singapore.

11. A*STAR's Industrial Consortium On Nanoimprint, or ICON, encourages companies to adopt versatile, industry-ready nanoimprinting technology that allows new chemical and additive-free products for the market. ICON is a multi-agency effort with support from Singapore's leading trade and industry development bodies - Economic Development Board (EDB), International Enterprise (IE) Singapore and SPRING Singapore.

Encl.  Annex A:  A*STAR Corporate Profiles

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For media enquiries, please contact:
Mr Eugene Low
Manager, Corporate Communications
for Institute of Materials Research and Engineering (IMRE)
3, Research Link
Singapore 117602
DID  +65 6874 8491
Mobile  +65 9230 9235
Email  loweom@scei.a-star.edu.sg

For technical, business and membership enquiries, please contact:
Dr Low Hong Yee (Chair, ICON)
Senior Scientist
Institute of Materials Research and Engineering (IMRE)
3, Research Link
Singapore 117602
DID  +65 6874 8133
Email  hy-low@imre.a-star.edu.sg

Dr Karen Chong (project on anti-bacteria surfaces)
Senior Research Engineer
Institute of Materials Research and Engineering (IMRE)
3, Research Link
Singapore 117602
DID  +65 6874 8426
Email  karen-chong@imre.a-star.edu.sg
Annex A – A*STAR Corporate Profiles

About the Institute of Materials Research and Engineering (IMRE)
Established in September 1997, IMRE has built strong capabilities in materials analysis, characterisation, materials growth, patterning, fabrication, synthesis and integration. IMRE is an institute of talented researchers equipped with state-of-the-art facilities such as the SERC Nanofabrication and Characterisation Facility to conduct world-class materials science research. Leveraging on these capabilities, R&D programmes have been established in collaboration with industry partners. These include research on organic solar cells, nanocomposites, flexible organic light-emitting diodes (OLEDs), solid-state lighting, nanoimprinting, microfluidics and next generation atomic scale interconnect technology.

For more information about IMRE, please visit www.imre.a-star.edu.sg

About the Agency for Science, Technology and Research (A*STAR)
The Agency for Science, Technology and Research (A*STAR) is the lead agency for fostering world-class scientific research and talent for a vibrant knowledge-based and innovation-driven Singapore. A*STAR oversees 14 biomedical sciences, and physical sciences and engineering research institutes, and seven consortia & centres, which are located in Biopolis and Fusionopolis, as well as their immediate vicinity.

A*STAR supports Singapore's key economic clusters by providing intellectual, human and industrial capital to its partners in industry. It also supports extramural research in the universities, hospitals, research centres, and with other local and international partners.

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