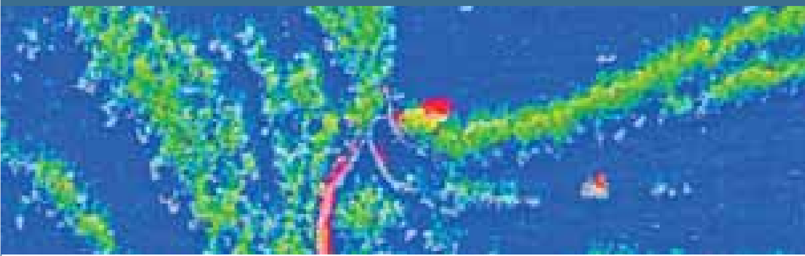
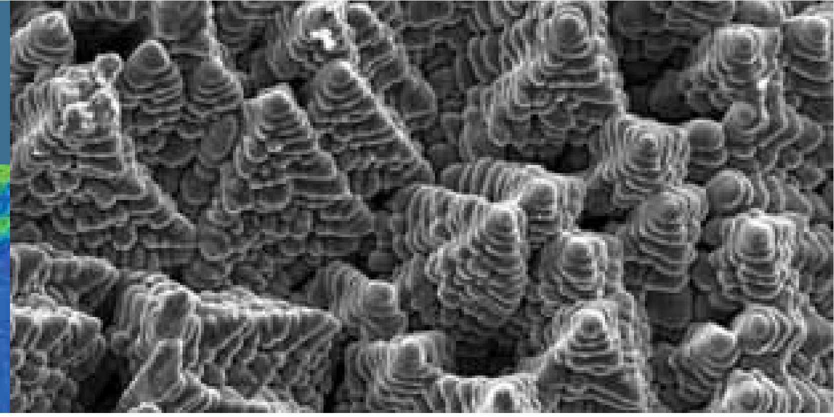


"FLOWER PATTERN", VORTEXES IN A FRICTION-STIR–WELDED JOINT OF MAGNESIUM ALLOY VERSUS ALUMINUM ALLOY



DENDRITIC MICROSTRUCTURE OF SPOT-WELDED GALVANIZED AUTOMOTIVE STEEL, OBSERVED WITH THE SCANNING ELECTRON MICROSCOPE

REDUCE-REUSE-RECYCLE

TESTING NEW MATERIALS IN AN AGE OF SUSTAINABILITY

"Reduce-reuse-recycle" is a mantra many take for granted these days: sustainability and conservation are being discussed across all industries. Even so, consumers, business and governments still demand new, "better-faster-stronger-less-expensive" products, so technology must evolve to keep up.

So how do you reconcile sustainability with the demand for innovative materials that can be produced and formed into products? The answer is in developing new engineered materials that in themselves aid conservation. A key factor is insuring that the characteristics and properties of these materials meet the demands of their intended use.

Ryerson's FEAS professors are advancing the development of new materials and are applying innovative approaches to investigate and understand their properties. Dr. Daolun Chen of the Department of Mechanical and Industrial Engineering studies material fatigue under different manufacturing conditions. In the Department of Aerospace Engineering, Dr. Jeff Xi looks at automation and Dr. Cheung Poon studies properties of composites and laminates.

The results of their work are already making a difference to the longevity and weight of new transportation components, biomedical implants and other human inventions. The Aerospace industry is interested in this work because a reduction in the weight of components means less fuel is needed. The automotive industry could benefit similarly, while longer-lasting parts could increase safety and reduce costs for the biomedical industry.

Dr. Poon jokes about being a welder, but it's clear that his work has broad-reaching implications in aerospace. "I'm interested in the properties of carbon fibre composites and fibre metal laminates," he says. "I study material failure by breaking materials. I want to know if the material is behaving in a ductile (stretching) manner, or is brittle, or if it's failed by a fatigue mechanism."

Dr. Chen studies fatigue and fracture resistance in high-performance advanced materials. His approach to the study of materials is being applied in his laboratory to a myriad of applications in aerospace, automotive, energy, biomedical, electronic and pressure-vessel industries. For reasons of safety, longevity and cost and environmental sensitivity, many transportation-related industries are interested in Chen's studies of how new materials will behave under different types of conditions. And knowing that an implant is strong and damage-resistant will mean a great deal to the biomedical industry, not to mention recipients of the implants.

Dr. Xi is interested in joining materials, but in a different way from Dr. Poon. "My goal is to bring greater efficiency and lower costs to aircraft manufacturing through research into robotic riveting," he says. "Right now, aircraft wings are riveted with a machine, and the rest of the body is done by hand."

In Xi's work, he may use some of the new materials that Poon, Cheung or others have examined in order to see how they might work in a robotic riveting environment. How strong, flexible, lightweight, is the final component after the robots have assembled it? Is the robotic process for assembling the component as efficient as or more efficient than manual assembly? "At the end of the day," Xi observes, "it's not enough to be faster and better, the component also has to be reliable."