
Technology
Innovation
Institute
Advanced Materials
Research Center
Innovating the
building blocks
tii.ae

Inspiring
innovation
for tomorrow

Pioneering advances in materials science

The building blocks of the mid 21st century are waiting to be discovered, harnessed and shaped. At the Technology Innovation Institute (TII), our new research hub dedicated to breakthrough developments in advanced materials is helping forge a new generation of materials with extraordinary properties.

With a powerful ambition to become an international center of excellence in materials science, our Advanced Materials Research Center (AMRC) is committed to innovation in the field of advanced materials, including meta, nano, smart, self-healing, additive manufacturing and energy-absorbing materials. All the research groups are supported by a numerical simulation team.

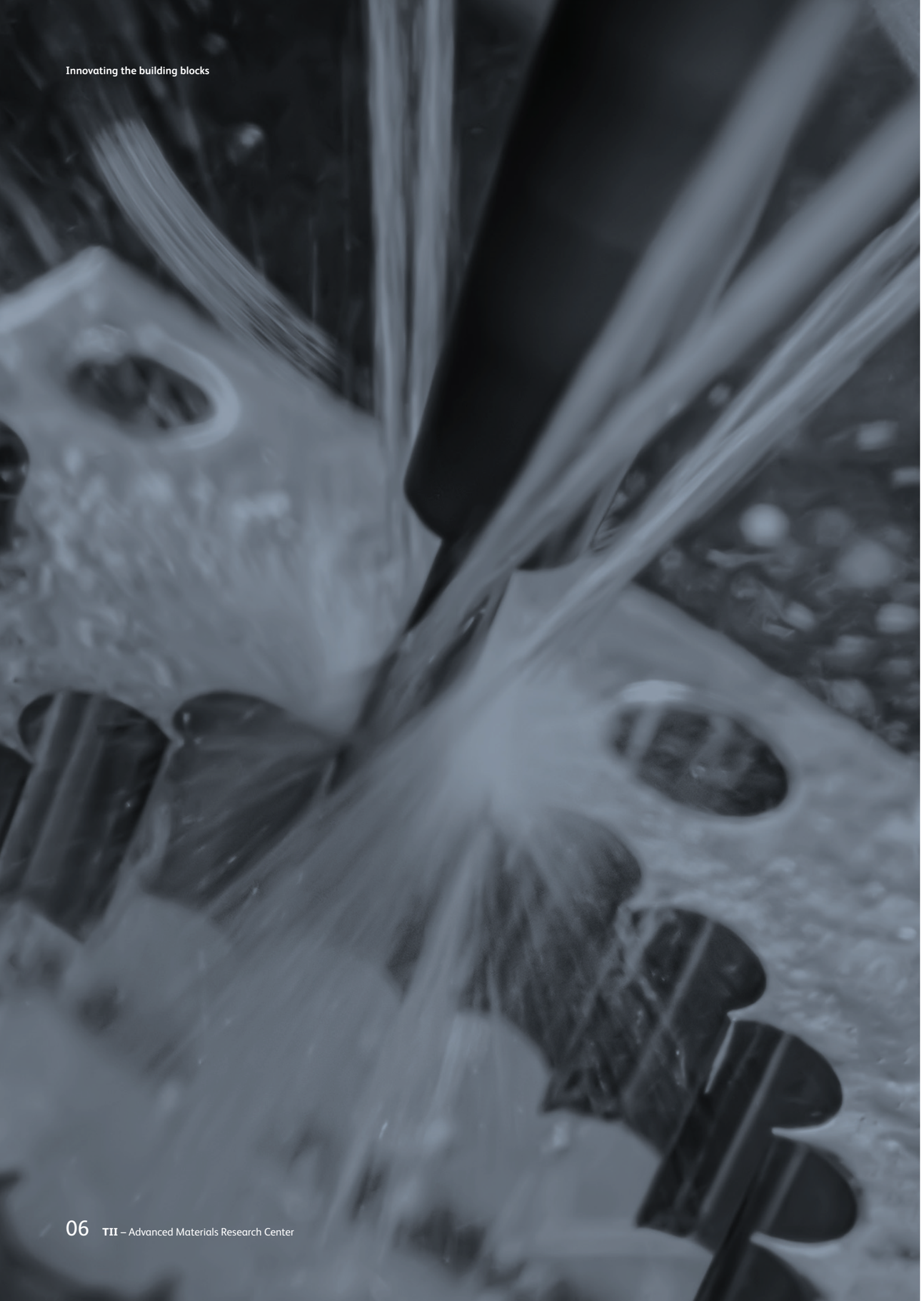
Today, our well-funded team of internationally recognized scientists are set to explore and harness capabilities at the very frontiers of advanced materials.

Who We Are

The Advanced Materials Research Center (AMRC) is committed to innovation in material science and to shaping metals and composites of the future. Backed by a well-funded team of internationally recognized scientists, the Center is dedicated to breakthrough developments in smart materials to help forge a new generation of advanced materials with extraordinary properties. The wide applicability of AMRC's work means it will find practical uses in industries and scientific disciplines far beyond our core focus areas.

AMRC is part of the Technology Innovation Institute (TII), a global scientific research center attracting the world's foremost scientists and researchers. TII leads worldwide advances in artificial intelligence, autonomous robotics, quantum computing, cryptography, and quantum communications, directed energy, secure communication, smart devices, advanced materials, and propulsion and space technologies, and biotechnology fields.

TII belongs to the Abu Dhabi Government's Advanced Technology Research Council (ATRC), which oversees the technology research in the emirate.



What We Do

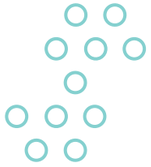
We conduct applied research on metals and composites, including meta, nano, smart, self-healing, energy absorbing, and additive manufacturing materials. In doing so, we bring these advanced materials to a stage where they are ready for implementation by industry.

We also support other TII research centers by developing the advanced materials they need to pursue their projects.

Our research areas include:

Our core research areas

AMRC works on multiple research areas in fundamental as well as applied science disciplines.



Nanomaterials

Our research efforts in nanomaterials include applications in different types of sensors (sensing materials) offering significant benefits to the homeland security sector among others.

Our research domains include:
- Graphene composites for sensing applications
- Graphene for water treatment
- Nanocomposites for coatings
- Nanomaterials to enhance the mechanical performance of different materials

Metamaterials

We are researching a new generation of artificial metamaterials with properties that extend beyond those of materials found in nature.

Our research domains include:
- Cloaking materials and stealth
- Elastic metamaterials that exhibit unusual vibrational and acoustic properties
- Metalenses and electromagnetic metamaterials

Self-healing materials

Our research into self-healing materials is devoted to develop ability of automatically repair damage without external diagnosis or human intervention.

Our research domains include:
- Self-healing bulk polymers
- Self-healing coatings and paints
- Self-healing composites

For anti-corrosion and anti-fouling surfaces, healthcare and electronic devices, and construction and structures applications.

Energy-absorbing materials

The broad array of uses for energy-absorbing materials makes this a priority research area for AMRC. These lightweight materials and structures are capable of absorbing extreme levels of energy, whether from a localized blast, impact loading or some other force.

Our research domains include:
- Hybrid materials based on combinations of dissimilar impact resistance
- Multifunctional materials and structures to absorb impact energy
- Advanced materials characterization for impact purposes
- Computational numerical simulations to predict material on impact loading

Additive manufacturing

Additive manufacturing makes it possible to produce intrinsically complex structures with enhanced properties, many of which were previously impossible to manufacture using traditional manufacturing processes. New opportunities in the field are continually being identified in aviation, healthcare, power, manufacturing, and beyond.

Our research domains include:
- 3D printing of high-performance metals
- Next Generation Materials for Metal Additive Manufacturing
- Design for Additive Manufacturing
- Multi-material functional additive manufacturing
- Process in-situ monitoring
- Topology optimisation for enhanced performance and light-weighting

Smart materials and structures

At AMRC, our work in the field of both engineered and naturally occurring multifunctional materials seeks to expand the universe of such materials and broaden their use cases.

Our research domains include:
- Sensing, actuation and energy transduction
- Morphing structures
- Controllable and monitorable energy, shock and vibration absorbers
- Prognostic live monitoring and reporting system of structural health
- Applying machine learning techniques for health monitoring

Energy Storage Materials

Set to contribute for nullifying the CO2 emission by 2050, our research efforts mainly focus on the development of eco-sustainable energy devices. Our technology, which stems from in-the-house lightweight and flexible freestanding films, can be designed to fit specific case applications. These latter ones including, but not limiting to small electronics, wearables, and health implants.

Our research domains include:

- Buckypaper design and customization for customized applications
- Supercapacitors and batteries, exploiting local resources and non-toxic solution for small electronics
- Solid-state Batteries (SSBs), targeting safer, longer-lasting chemistries to ensure competitive products

Thermoplastic Materials

Our diverse research efforts in composites and Thermoplastics provide product solutions for a variety of different applications in the fiber-reinforced composites market. These applications include, but not limited to the automotive, aerospace, maritime, construction and last but not least, oil and gas markets. This supports the strategic vision of TII in positioning the UAE as one of the technology leaders in composites automation and lightweight materials' manufacturing both worldwide and regionally.

Our research domains include:

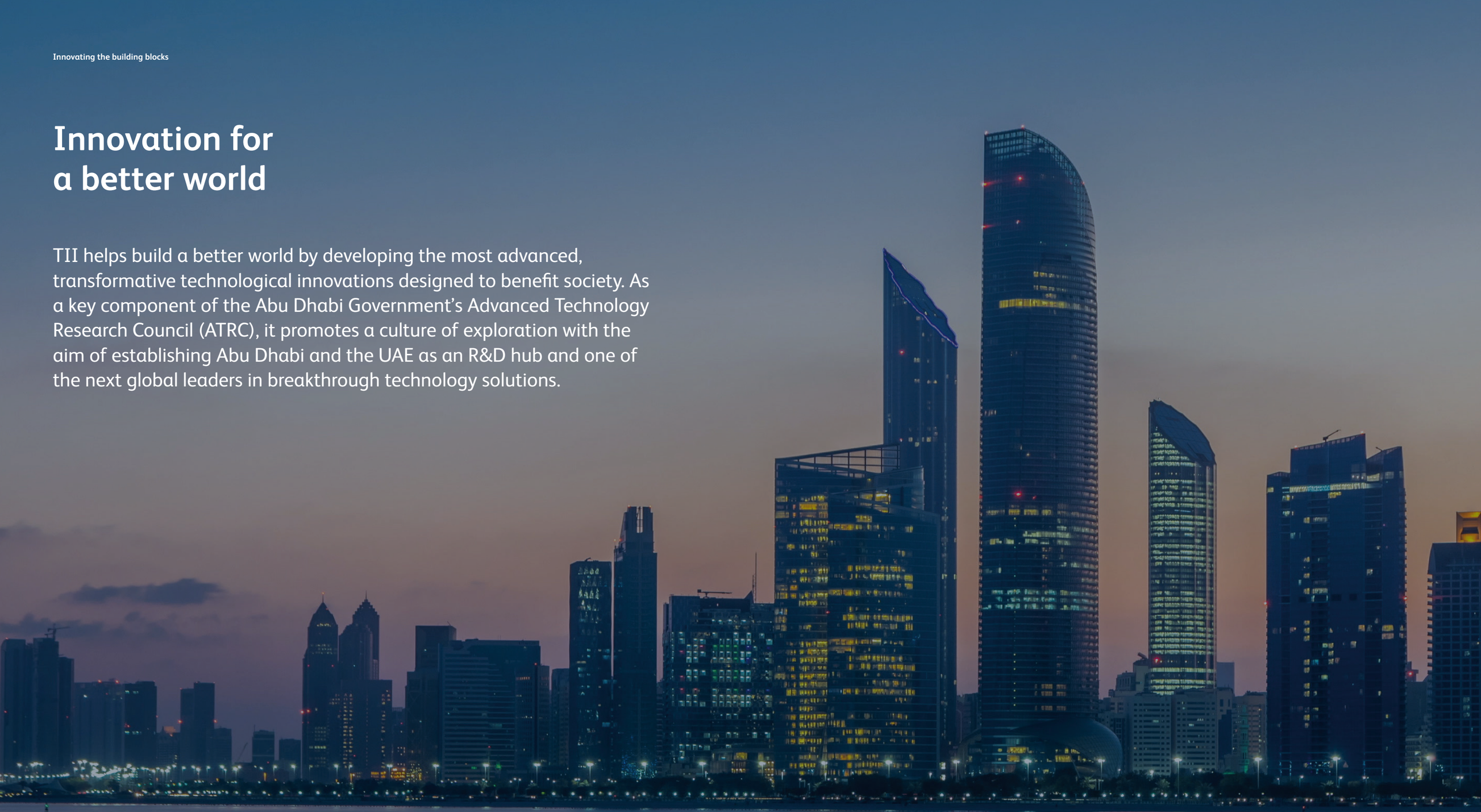
- Through-thickness reinforcement of composite materials
- High-performance Thermoplastics composites
- Multifunctional composites and textiles
- Composite manufacturing automation
- Bio-based and sustainable composites

Sharpest minds, toughest questions

AMRC brings together a fast-growing team of the sharpest minds from across the global advanced materials community to investigate the toughest questions, respond to the greatest challenges and change the world for the better.

Innovation for a better world

TII helps build a better world by developing the most advanced, transformative technological innovations designed to benefit society. As a key component of the Abu Dhabi Government's Advanced Technology Research Council (ATRC), it promotes a culture of exploration with the aim of establishing Abu Dhabi and the UAE as an R&D hub and one of the next global leaders in breakthrough technology solutions.



Ahead of the curve, beyond tomorrow

Today, the advanced materials being researched here at TII offer a wide range of potential uses in everyday life, including revolutionary energy-absorbing materials capable of sustaining dynamic impact – and many more.

To ensure continued innovation and critical breakthroughs, our scientists collaborate with other centers of excellence in higher education and research in the UAE, in the MENA region and around the world.

Our center also focuses on the development of pioneering smart materials that can help identify and solve the problems of damaged critical equipment.

Advanced Materials Research Center

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