



IRC for Advanced Materials



MOTIVATION

- Advanced materials are a critical launch pad for disrupting traditional industries and are a fantastic opportunity to facilitate manufacturing localization within the Kingdom across many sectors



OVERALL AIM

- Develop advanced materials for oil and gas, pipelines, construction, packaging, healthcare, and other industries
- Develop methods to turn waste into useful materials (e.g., advanced carbon fibers)
- Develop efficient techniques for the utilization of new material in new and existing industries
- Study the characteristics of new materials (e.g., degradation, corrosion, resilience, longevity, tolerance to weather condition)
- Utilize hydrocarbons in new sectors by developing new non-fuel uses for hydrocarbon in new materials



FOCUS AREAS

Coatings & surface engineering

- Corrosion, wear, impact & fatigue resistance
- Electromagnetic/ultraviolet radiation protection
- Fire/flame retardant
- Fouling & microbial resistance
- Self-cleaning and anti-dust
- Lubrication

Lightweight materials

- Light alloys (Al, Mg, Ti), plastics & composites
- Lightweight vehicles, systems & components
- Low-cost fiber reinforced polymer composites
- Degradable polymer for recycling & less waste
- Lower flammability, toxicity & cost of polymers
- Joining lightweight dissimilar materials

Smart materials

- Self-healing materials & coatings
- Smart plastic packaging
- Smart windows
- Smart wearable textiles & sensors
- Explosive, gas, and leak detection sensors

Corrosion & scale inhibitors

- Sweet, sour & acid corrosion
- Fes, CaSO_4 , BaSO_4 , CaCO_3 scales
- Corrosion in cooling water system
- Volatile corrosion inhibitor packaging materials



BIG QUESTIONS / CHALLENGES

Materials degradation

- Total annual cost of corrosion in KSA is greater than \$24.8 billion (~2.7% of GDP) [2012]

Waste management

- Total annual waste in KSA is greater than 150 million tons [SIRC]

Energy consumption & CO₂ emissions

- About 20% of the global total energy consumption is due to overcoming friction [Friction, 2017]

Hydrocarbon-based materials

- Plastics constitutes only 6% of the total tonnage in materials



DEPARTMENTS INVOLVED

Materials Science & Engineering

Mechanical Engineering

Chemistry

Physics

Mathematics

Electric Engineering