



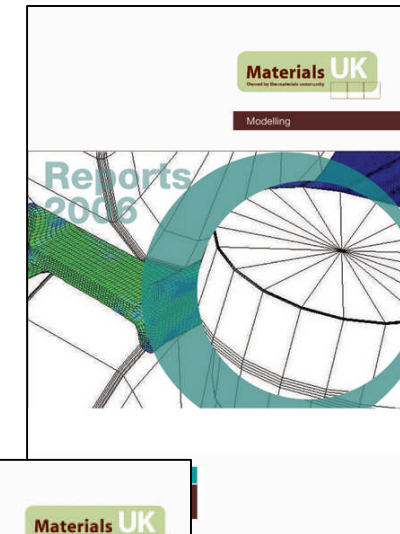
## ***Materials UK Launch 2006 Science & Technology***

*Graham J Davies  
School of Engineering  
University of Birmingham*

*Chairman – Science & Technology Task Force*



# Materials Innovation & Growth Team - Science & Technology Task Force



*Recommendations:*

- *The UK must develop a National Materials Network for efficient & effective use of its asset base.*
- *Continuity of Funding is essential if Materials Innovation is to be nurtured and brought to fruition.*
  - *SBIR, DARPA and Procurement*
- *Materials for Energy must be a priority for R&D Funding*

| Energy  | Plant/ components   | Structural Materials  | Functional Materials  | Multifunctional Materials  | Biomaterials  |
|---|---|---|---|--|---|
| Generation<br><i>Conventional and advanced fossil</i> | e.g. Steam turbines Boilers<br>Gas turbines   | Steels<br>Alloy steels  | Activated carbons<br>Filters  | Structural health monitoring systems   | Anti-corrosion biofilms   |
|   | Gasifiers<br>Fuel cells<br>Hydrogen from coal<br>Coal liquefaction                                    | Superalloys<br>Ceramics<br>Composites<br>Coatings                           | Interconnectors<br>Membranes<br>Sorbents<br>Chemical looping materials                                | Diagnostic Smart materials<br>Catalytic filter materials   |   |
| Generation<br><i>Nuclear</i>                          | e.g. Boilers & turbines<br>Decommissioning/ storage<br>Reactor vessels<br>Fission/fusion materials    | Steels<br>Alloy steels<br>Superalloys<br>Ceramics<br>Composites<br>Coatings | Filters,<br>Active carbons  | Structural health monitoring<br>Materials for remote robots<br>Self-repair materials<br>SMART materials  |   |
| Generation<br><i>Renewable</i>                        | e.g. Wind turbines<br>Tidal power<br>Hydro turbines<br>Biomass plant<br>Heat exchangers<br>Fuel cells | Composites<br>Polymers<br>Steels<br>Superalloys<br>Ceramics<br>Coatings     | Photovoltaic<br>Thermal materials<br>(Geo and Solar)<br>Fuel-cells materials<br>Anti-fouling coatings | Photovoltaic materials<br>Piezoelectrics<br>Fuel-cell materials<br>Catalytic Filters<br>Conducting membranes<br>Solid Electrolytes<br>Thermoelectrics<br>Power harvesting<br>Structural health monitoring<br>SMART actuation materials | Biofuels<br>Biomimetic structures<br>Biohybrid materials<br>Anti-corrosion biofilms |
| Transmission  | e.g. High conductivity applications<br>Insulators<br>High Strength                                    | Ceramics<br>Polymers<br>Composites  | Piezoelectric materials<br>Superconductors  |  |   |
| Storage<br><i>Electrical</i>                          | e.g. Batteries  | Ceramics<br>Non-ferrous alloys  | Electrode materials   | Electrolytes<br>Materials for integrated power systems   |   |
| Storage<br><i>Hydrogen</i>                            | e.g. Pipelines<br>Compressors<br>Pressure Vessels   | Steels<br>Alloy steels  | Carbon Nanostructures<br>Activated carbon membranes   | High capacity/integrity  |   |
| Conservation  | e.g. Lightweight structures<br>Thermal insulation   | Composites<br>Ceramics  | Photochromics<br>Electrochromics<br>Thermochromics  | Smart packaging<br>Insulation<br>Energy harvesting   | Biodegradation  |



# Materials for Sensors & Diagnostics

| Sector         | Structural Materials                                      | Functional Materials   | Multifunctional Materials   | Biomaterials  |
|----------------|---|--|---|---|
| Healthcare     | Implant wear / prosthetics                                | Telemedicine/ robot surgery<br>Body signs                    | Health monitoring 'wearables'<br>Remote sensing<br>Biocompatible materials<br>Compatibility | Assays<br>Drug delivery systems<br>Intelligent Implants |
| Energy         | Fuel cells  | Fuel cells   | Fuel cells  | Waste management  |
| Construction   | Lifetime measurement                                      | Concrete ageing  | Structural health monitoring/<br>diagnostics  | Microbial hazards                                       |
| Transport      | Composite monitoring                                      | Heat, pressure, wear<br>Asset management<br>Proximity alarms | Integrated sensors/ actuators<br>Self-diagnostics   | Driver alertness<br>Environment quality                 |
| Retail         |   | Produce lifetime<br>Stock management                         | Smart packaging<br>Sports equipment<br>Product Tagging<br>Printable power                   | Antifouling<br>Biosensing                               |
| Communications | Asset management –<br>proactive fault<br>reporting        | Magnetic<br>Optical<br>Network security                      |   | Biomimetic networks                                     |
| Security       | Structural/building<br>management –<br>earthquake sensors | Smoke detection<br>Gas detection<br>Identification           | Anti-counterfeiting<br>Offender tagging<br>Biometrics                                       | Biometrics<br>Biohazard detection                       |



## Materials Innovation & Growth Team - Science & Technology Task Force

### *Recommendations:*

- *Sensors & Diagnostics have been identified as a critical growth area and materials are fundamental to their development and applications.*
- *The holistic modeling of Materials on length and timescales facilitates the development of new materials & processes in a timely and more cost effective manner.*

*Recommendations:*

- *A sustainable, long term strategy for structural materials is essential for the well being of UK industry and academia.*
- *Multifunctional materials demand investment in both basic and applied research.*
- *Support for biomaterials is essential particularly for the development and refinement of bioresorbable and bioactive materials as a healthcare priority.*

*Recommendations:*

- *Nanotechnology must be further supported to drive innovation through to industrial exploitation.*
- *The engagement between designers and materials technologists must be facilitated to encourage exchange of information leading to new and innovative applications of materials.*



*The Way Forward:*

- *This is the 2nd Meeting of S&T for MatsUK*
- *A new task group needs to be formed*
  - *The Vice-Chairman will form a small group to select people on the basis of their technical area.*
- *A new work programme needs to be developed.*
- *There are actions from the IGT report on Key Performance Indicators that S&T are required to complete by a specific time.*



# Materials UK

## Science & Technology Task Force

- *S&T Working Group to publish the reports produced by the Task Group and continue its work highlighting priority topics in underpinning materials technology for the Technology Strategy Board and Research Councils by October 2006 for the 2007 calls for proposals*
- *S&T Group to work with the Energy Group to construct a proposal for an Energy Materials Technology Platform by end of October 2006.*
- *Deliver a standard methodology for life cycle and design for life concepts and factual data for materials within a sustainable production and consumption agenda via the KTN nodes and Property Validation Centre by end of December 2006.*



## MaterialsUK Science & Technology Task Force

- *Materials Assets Connect formally launched by end of December 2006*
- *Produce or update existing foresight technology and research road maps that identify technology or research themes to support UK industry every two years.*
- *Produce at least one state of the art review per year on developments within each key technology area.*
- *Coordinate International activities on behalf of MaterialsUK.*



MaterialsUK  
Science & Technology Task Force

*Contact:*

*Mrs. Jackie Butterfield*  
*(Jackie.Butterfield@iom3.org)*