

Materials and Minerals – the key building blocks for our future prosperity

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Materials and the minerals from which they are sourced underpin everything we do and need to survive and enjoy life: housing, roads, transport, communications and a whole range of modern consumer products are fundamental to our everyday lives, and depend on the availability of mineral based components. The economic value of minerals extraction in the UK amounts to some £120 billion per year, which is greater than the contribution from agriculture, forestry and fishing put together. Yet there is no doubt that materials and minerals are taken for granted by society as a whole, and few people have any awareness of how many mineral elements are needed to make an everyday product such as a mobile phone handset, or where they come from, or how they could be recycled.

New materials technology is also fundamental to pushing forward the frontiers in energy, healthcare, telecommunications, IT and security, to name but a few areas. The UK has a significant track record in materials innovation, and current developments in these areas provide huge opportunities for the future. For example, in recent years fuel cell technology has been heralded as a keystone of the future energy economy, potentially offering huge benefits to society and significant economic gain for the UK. Fuel cell technology promises to reduce CO₂ emissions through enhanced conversion efficiency and, in the longer term, to provide the means to implement the hydrogen

economy. However, the scale of implementation of fuel cell technology depends critically on a number of materials-dominated factors – improved durability and lifetime performance, and reduced cost – these being the key to dominating future markets.

In healthcare, the drive to replace more complex tissues and organs in orthopaedics, dentistry, cardiology, urology, ophthalmology and wound repair, and to reduce the mortality and economic price resulting from implant failure, is fundamentally dependent on the development of new biomaterials and of techniques to monitor their behaviour in the body. Continuing miniaturisation in electronic devices, IT and communications technology makes increasing demands on “functional” materials – the silicon chip, light emitting materials, liquid crystal displays and magnetic materials. One of the keys to competitive advantage is the development of products with increased levels of functionality, and here “smart materials”, those which form part of a system which can sense and respond to a changing environment, will play a critical role. In most sectors of business development, materials are fundamental to advancement and gaining advantage.

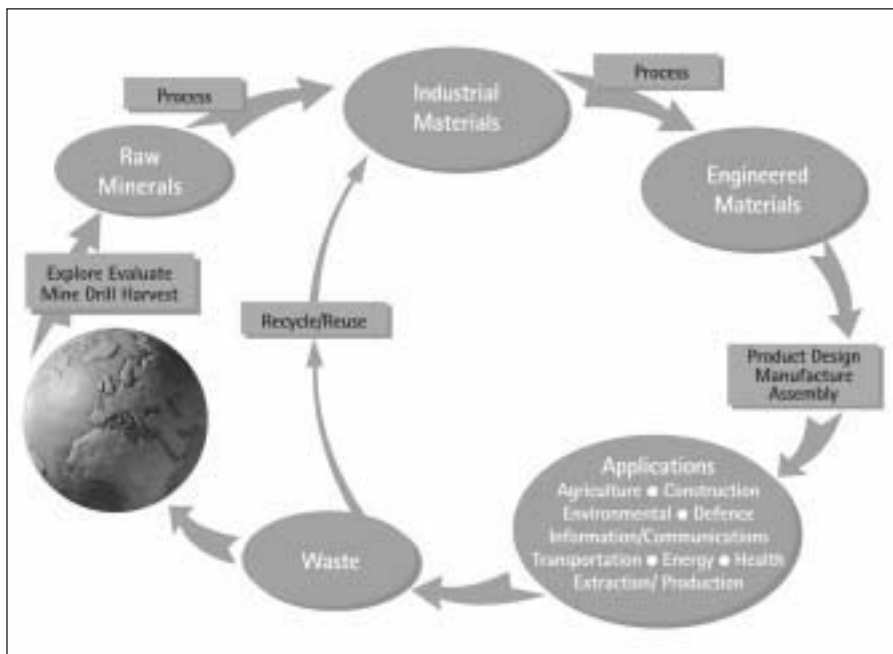
A global network for materials and minerals

Promoting the importance of materials and minerals, providing support and assistance to

individuals and industry concerned with this technology, and fulfilling an educational role are key activities of the Institute of Materials, Minerals and Mining. The scope of this professional organisation encompasses the complete materials cycle, from minerals exploration and extraction, through characterisation, processing, forming, finishing and application, to product recycling and land re-use [see diagram]. Through its local and technical networks, the Institute provides support for the professional activities of its members across all of these sectors, whether in research, industry, business, academia or education. This network is not restricted to the UK – the organisation has a global outlook, with established overseas branches, and engages in collaborative activities with several sister societies in the USA, Far East and Australia. Cross fertilisation of ideas through a global network, overseas interactions and the exchange of information are all beneficial in providing enhanced services to members and increased opportunities for raising the profile of materials and minerals across the globe.

Advancement through knowledge transfer

Access to technical information and knowledge transfer are one of the keys to technological advancement, and these are core services provided by the Institute through information and library services, events,



satisfying and challenging careers following degrees in materials.

Within its staff, the Institute has an active education team which provides support to teachers at both primary and secondary level, and visits schools around the country to enthuse young people about the subject of materials and minerals, and help them appreciate its relevance to their National Curriculum studies. The Institute has recognised that it is only by reaching young people at a relatively early age that the awareness of materials and minerals as a career option can be developed. During the past year, the Institute's staff team was in contact with nearly 5,000 children in schools all over the UK. A major new initiative launched by the Institute to further boost the profile of materials in schools is a proposed materials AS and A level (or equivalent qualification). This has received substantial endorsement from Institute members, teachers, industry and financial sponsors. A project of this type obviously requires significant investment, and so far financial support is being provided by university course providers, and by individual members of the Institute, as well as through part of the Materials in Schools programme supported by the Gatsby Educational Trust.

Materials are playing an increasingly important role in our everyday lives and our society. Understanding and acknowledging that role, and incorporating advanced materials development in our manufacturing and innovation strategies, is one of the keys to providing wealth creation and commercial success in the future. The Institute is determined to play an increasingly important role in the broader understanding of materials and minerals use, and to support both its members and the community as a whole with the information and networks appropriate to meeting this need.

publications and access to advice from materials experts. The Institute recognises that many companies, particularly SMEs, may not have in-house materials expertise. To provide this support, the Institute's Industrial Affiliate Scheme is a valued service to industry, giving troubleshooting advice and help to companies in the selection of materials and processes for more profitable and competitive products. One of its latest initiatives, supported by the DTI, is a scheme to assist start-up and university spin-out companies in the materials sector.

The organisation works closely with Government and EC departments, particularly in relation to the delivery of new technology to industry. The Institute and its members have been continuously involved in the development of reports in the Materials Foresight exercise, looking at the future materials priorities to enhance wealth creation and the quality of life. The Institute's 16 technical divisions have also been actively developing technology roadmaps in a number of different materials sectors. These have served to reinforce the importance of the role

of materials, and the need for this to be recognised to ensure success and competitive advantage in the 21st century.

Inspiring the younger generation

The Institute is also addressing the issue of attracting young people into the profession to ensure a supply of materials and minerals scientists, technologists and engineers for the future. Advancement and innovation can be hampered by the lack of suitably qualified people, and there are many examples of organisations who cannot find individuals with the required expertise in materials. Conversely, those who have graduated with good degrees in materials or mining subjects are open to opportunities in a wide range of careers, not only in minerals and mining operations and materials development and research, but in the business, environmental, consultancy, planning and financial sectors. Historically the study of materials science at university has appealed to young women as well as men, so there are plenty of examples of women who have also achieved

The Institute of Materials, Minerals and Mining is one of the UK's major engineering institutions, established by Royal Charter in 2002. It was created from the merger of the former Institute of Materials and Institution of Mining and Metallurgy, both of which had roots going back to the 19th century. Based in London, the Institute has over 20,000 members, with over a quarter of its membership outside the UK. Full details about the Institute and its activities are available on the Institute website at www.iom3.org