

In today's industrial sector there is an undeniable trend towards greater sustainability in both products and production techniques. This trend towards 'greening' our society demonstrates that economic prosperity and sustainability can go hand in hand. What is more, the same breakthroughs in materials technology that are required to stimulate economic growth can also contribute to solving a number of contemporary societal problems. It goes without saying that a vital and innovative economy is a prerequisite for a sustainable society, and vice versa. The ultimate goal is to provide long-term, highly functional and competitive solutions to issues involving energy, the environment, mobility, safety & security, health care and water – solutions which can reduce our ecological footprint and make our society more sustainable.

Energy

Energy is vital to our society. The world energy demand will increase by more than 50% between today and 2030. The two main problems involved are the exhaustion of our fossil fuel reserves and environmental pollution. For those reasons the policy program of our government (project "Schoner en Zuiniger") emphasizes extensively the need for energy savings and energy efficiency and the transition towards more sustainable sources of energy like solar, wind and biomass. Materials research will play a key role in further developing all possible options in order to solve the energy problem. Examples are insulating materials and coatings to make housings and buildings energy neutral, light-weight materials to reduce the energy consumption in the transport sector, high temperature resistant coatings to reduce friction and wear of engine parts, and new materials for fuel cell applications and for solar and wind energy.

Environment

Our society is increasingly being exposed to air and noise pollution, stench and waste and to climate change as a result of global warming. The most striking problems are energy consumption and corresponding emission of greenhouse gases caused by transport (automotive, aerospace, inland waterways and maritime), by industry, by housings and buildings, and by all kinds of electrical appliances and equipment for domestic and industrial use. The Dutch government has committed itself to an emission reduction of CO₂ of at least 20% in 2020 with 1990 as reference point. After the expiration of the Kyoto protocol in 2012 new targets will have to be set and the Netherlands are even willing to reduce the CO₂ emission by 30%, if other countries are going to join this ambitious target. Some examples, where innovative materials can play a key role in diminishing the environmental burden, are the development of fully recyclable and / or re-usable materials, new catalysts and membrane filters for a reduction of 75% of NO_x and PM₁₀ in the period 2012-2020, reducing resource consumption in the production environment in terms of materials and energy, and corrosion resistant coatings to avoid early repair and / or replacement of materials.

Mobility

The road-traffic intensity in the Netherlands is high, but also shipping and railway-traffic increase steadily due to a growing economy demanding more transport of cargo and people. This has to be organized in a fast and efficient way without jeopardizing the health and safety of

people. The following materials related issues are key in mobility: increase of the crashworthiness of trucks and cars by at least 30% through high-strength and low-weight materials, increase of the collision resistance of ships, improved failure and fatigue resistant materials for airplane constructions, and materials for noise absorbance by road-surfaces and sound-walls to improve the common well-being of our society.

Safety and Security

Citizens expect from their own (local) government a safe and secure environment, not only at home but also during work and in the public space. They want to be protected against molest, war, acts of terrorists, robbery and burglary, negative effects of climate changes, and diseases. Also the supply of healthy nutrition is considered as a responsibility of their own government. The following aspects can be mentioned: new materials for climate control systems to improve the air quality of buildings and public infrastructure, fire-resistant materials for the safety of buildings and constructions, fire and explosion-resistant containers for transport purposes, protective clothing for police forces, military forces and fire brigades, and corrosion-resistant coatings with anti-bacterial protection for food and drink packaging.

Healthcare

The revolutionary development of new diagnostics and devices, and the development of new drugs and treatments make it possible to discover diseases earlier and to treat them more effectively. This will improve the quality of life of an aging population. The opportunities for innovation and growth in the health care sector will boost the economic activities in this business in the Netherlands. While at the same time these new technologies will help controlling the rising health care cost. A few materials related options are: new biocompatible materials for devices like catheters, pacemakers, stents and other (semi-permanent) implants, material innovations to allow miniaturization and function integration in electronic devices like MEMS and SiP, (bio)chemical modification of surfaces and interfaces for controlled drug delivery, and biocompatible materials for prostheses and joint replacements.

Water

For many centuries water has been an enormous factor of importance in the Netherlands. This societal theme has many aspects and gets extra attention nowadays because of the global warming problem and the consequently rising sealevel. Reliable supply of clean drinking water is another issue of permanent and high importance as well as the protection against water as a result of erosion of dunes, camp sheds and river shores. Some materials related issues are: new technologies and material break-throughs in the entire process of water production, purification and delivery (new sensor and filter techniques), anti-fouling and self-cleaning coatings to prevent marine fouling of ships and the flood barrier in the Eastern Scheldt estuary, new techniques and materials for the fast assembling of barriers, dikes and banks against suddenly arising floods, and abrasion-resistant coatings and materials for the dredging industry.