



STRASBOURG, FRANCE

NOVEMBER 18 – 21, 2017



VI WORLD MATERIALS SUMMIT®

MATERIALS INNOVATION FOR THE GLOBAL CIRCULAR ECONOMY AND SUSTAINABLE SOCIETY

OUTCOME

FORUM FOR NEXT GENERATION RESEARCHERS

EUROPEAN YOUTH CENTRE

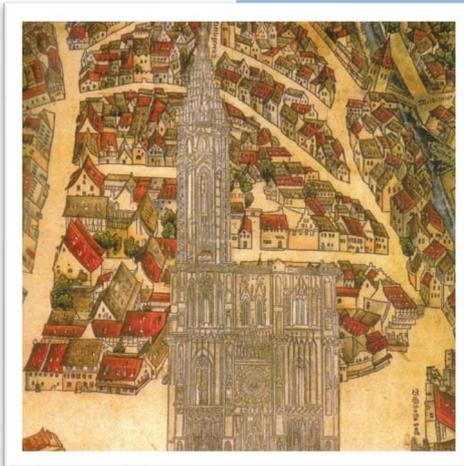
NOVEMBER 18 – 19, 2017



VI WORLD MATERIALS SUMMIT

COUNCIL OF EUROPE

NOVEMBER 20 – 21, 2017



Organized by:



Africa



Australia



Brazil



India



Japan



Korea



Mexico



Russia



Singapore



Taiwan



EUROPEAN MATERIALS RESEARCH SOCIETY

Strasbourg 2017 Declaration on Materials Innovation for the global circular economy and sustainable society

More than 80 senior materials scientists, leading industrialists and policy leaders from many parts of the world attended the “VI World Materials Summit” held in Strasbourg, France on 20th-21st November, 2017. The Summit was hosted by the European Materials Research Society (E-MRS), the Chinese Materials Research Society (C-MRS), and the International Union of Materials Research Societies (IUMRS) representing the whole world. The topic of the 2017 Summit was “Materials Innovation for the global circular economy and a sustainable society”.

As the population continues to grow, the whole world faces the challenges of varying deficiencies in energy, potable water, nutrition and food, critical materials, degradation and disruption of the environment, climate change, inequalities, and actions to combat increasing desertification, etc. Delegates examined possible strategies for a circular economy and sustainable development offered by new materials, with case studies and examples from various countries being presented. Specifically, innovative technologies for recycling, energy supply for end use applications energy storage, green energy (solar, wind, etc), , etc. were discussed in detail. These technologies require new and improved materials and manufacturing processes. Innovative actions are needed to increase efficiency and reliability, to decrease greenhouse gas emissions, to reduce capital costs, to extend operational life time and ensure that essential products and services are available for all citizens of the world.

In addition, 30 selected young researchers from all over the world participated in the summit and expressed their views on the world’s needs and solutions.

During discussions, key conclusions on the five themes of the Summit are summarized as:

1. Energy supply for mega cities in the future:

- In the mega cities of industrialized countries, a push the drive towards renewable energy with the priority on generating low carbon solar PV and thermal, wind energy etc. may not exceed 50%. Only when massive energy storage capability becomes available will it make renewable energy with storage, competitive with the current conventional large electricity supply sources like natural gas and nuclear.
- The challenges ahead of nuclear energy are its public acceptance, cost competitiveness among clean energy options and policy frameworks for a balanced foresight. For most large cities and mega users nuclear energy with the safer and more sustainable Gen IV reactors could emerge as the carbon free optimum solution.
- Significant energy efficiency improvements are possible with new materials in turbines, facilitating high temperature operation, and electric vehicles. New bio-inspired higher efficiency energy sources need to be developed. Harnessing micro bacteria is the new direction for processing refuse like solid waste and sewage from mega cities.

2. Energy supply for developing communities in the future:

- In rural or decentralised economies, there is a need for a diversity of energy technologies and renewable energy will play the essential role. With the priority of minimizing the use of carbon, solar PV and solar thermal is becoming the visible option
- To mitigate CO₂ emission, increased efficiency of its capture and conversion to valuable chemical products and liquid fuels at competitive cost employing new technologies is essential
- Clean energy using Hydrogen is another solution, but the production and storage of H₂ needs to be further developed.

3. Circular Economy enhancement

Recycling, including Li-batteries, rare earth rich products at end of life, etc. are problems for science and technology as well as having social and cultural implications.

- It is a country's responsibility and thus a policy obligation. Education on the need for recycling is essential. Recycling technologies need to be improved as current technologies are very uncompetitive in terms of cost, inefficient and frequently create environmental problems.
- Electric vehicle development has been impaired by the limited and high price of certain elements, particularly lithium and cobalt. Electric, hybrid or fuel cells cars are definitely the future modes of personal transport. It is necessary to increase current densities, enhance safety and lower Li and Co the capital cost.
- Recycling of all materials currently used in the production processes must be considered when designing new products.

4. From materials to systems for the ICT society

- New materials and sensor devices will enable smart electric grid to safely distribute a high percentage (30%-50%) of renewable energy. An efficient and reliable smart grid system will transform the electric power industry into a new era.
- The market of flexible electronics with large area, low-cost, and good performance and functionality for wearables, security, smart packages and health monitoring/diagnostics are being developed rapidly and are destined to be the next generation of technologies.

5. Disruptive materials for the future

- 3D additive manufacturing technology can produce objects having almost any shape or geometry with elements and phases which to date have been difficult or impossible to combine. Advanced materials and processes with life cycle management using digital platforms are emerging as new frontiers. Materials genome and integrated computation materials engineering are new possibilities having immense potential applications. The material additive manufacturing technology has a wide spectrum of applications in spacecraft, consumer products, defence equipment etc.
- Nanomaterials and technologies have many applications in health, such as diagnosis, control, prevention, and treatment of diseases. The nanomedicine market will expand rapidly. The ethical aspects must not be neglected; in addition, progress in computing and materials modelling has enormous potential for developing new materials.

- Disruptive materials such as nano alloys and materials, high entropy alloys, advanced composites, etc should be given more funding. Materials like SiN, GaN, diamond and coatings etc. for power electronics are also finding big research funds for the global economy and sustainable society.

The participants emphasised that planet earth is searching for the next paradigm change in the world's ecosystems to meet the aspirations and responsibilities to ensure sustainability to combat the world's current inequalities, but even this is perhaps inappropriate in this type of document.

The Circular Economy with efficiency and effectiveness in various segments of the value chain is an answer to the search which requires focus, continued dialogue with stakeholders, prioritisation, funding and collaboration.

Whatever the solutions are; materials is the core for future sustainability and quality of life. A new generation of young research leaders to enhance international understanding with the ability to collaborate and communicate with all levels of society regarding materials research and development is the foundation on which the future depends; so was the final echo of the Summit.



SUSTAINABLE DEVELOPMENT GOALS



EUROPEAN MATERIALS RESEARCH SOCIETY

BP 20

F-67037 STRASBOURG CEDEX 2

TEL +33 (0)3 88 10 65 43

EMRS@EUROPEAN-MRS.COM

WWW.EUROPEAN-MRS.COM