

DRAFT JOINT LAB ROADMAP

Research Guidelines for the Joint Lab on Graphene-Polymer Research (taken from the provisional Materials 2030 Roadmap)

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Materials for health and medical market

- (a) Advanced surfaces for health and medical applications with improved functionality and biocompatibility, increased performance, sensing and durability
- (b) Additive manufacturing (AM) can be used in a variety of medical applications. Among these are personalised implants and prosthetics, membranes and scaffolds, and the use of 3D models in preoperative surgical planning
- (c) Functional materials are mandatory for the development of the medical devices of the future. The future comprises regenerative medicine, cell therapy, nanomedicine, rehabilitation, and several other technologies at the interface of materials science, biology, and biomechanics among other areas.

Materials for sustainable construction market

- (a) Materials for improved energy efficiency:
 - Thermal insulation materials & infrastructures
 - Advanced materials for thermal energy storage and for district heating and cooling applications
 - Multifunctional lightweight materials (including functionalization by nanotechnology).
- (b) Materials with new functionalities / Smart materials
 - Advanced materials for lighting technologies (e.g. LED, OLED).
 - Advanced materials for electrochromic active dynamic glazing

Materials for new energies market

- (a) Advanced materials for renewable and low-GHG-emission energy production technologies (Solar PV, CSP, wind, bioenergy, geothermal...)
 - Post silicon solutions, flexible photovoltaics (PV), tandem, BIPV ...
- (b) Advanced materials for energy storage, facilitating the integration of renewable energy
 - Functional metal foams for electrocatalysis (e.g. hydrogen production)

Materials for home and personal care market

- (a) Development of new feedstock solutions to produce already established advanced materials for the personal and home care.

- The transfer from petrochemistry to biobased chemistry is not a viable solution (should consider the demand of crop areas for world food supplies). Therefore, the application of new feedstock solutions requires utilization of second generation (waste streams) and third generation (algae) biomass or direct carbon capture from atmosphere.

(b) Materials for design and circularity and reuse

- 3D printing or additive manufacturing

(c) Development of multifunctional surfaces and coatings that play a decisive role in the function and performance of different components and systems, adding functional properties, such as easy to clean, antimicrobial surfaces or specific optical properties

- Design of a suitable surface nanostructure, coating layer (from single layer up to complex interference systems) .

Materials for sustainable textile market

(a) Advanced biobased and renewable fibres and textiles for functional and technical applications.

(b) Smart E-textiles for smart wearables and large-area surfaces and their efficient integration, manufacturing, and recycling.

Materials for electronics appliance Market

(a) 5G networks require new levels of RF transparent and heat dissipating materials. Signal transmission and thermal management will be critical. 5G transmitters call for robust, low-loss materials to minimize radio frequency interference in the mm wave spectrum.

(b) Sustainable conformable and flexible electronics .The challenges concerned flexible/stretchable sensors will be to maintain the integrity of material properties and at the same time to meet the requirement of quality printing. Printing is at a mature stage in development. However, there is need for further development of materials (inks) and additive manufacturing technologies if these sensors are to be mass-produced for large scale mainstream consumer-related applications with emphasis on recyclability.