H2020-MSCA-RISE-2016-734164 Graphene 3D

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Project Results

Completed Deliverables in 2019

o **WP1, D1.3. Annual progress report, M36**
o **WP3, D3.1. Report of essential nanostructure parameters, M35**
o **WP5, D5.1. Robust nanocomposite design tool, M30**
o **WP8. D8.3. Report on Project Meetings and Networking, M30**
o **Milestone MS2 (WP4, WP5): Optimized nanocomposite material's formulation for 3D printing applications, M36**

### WP3, D3.1. Essential nanostructure parameters

HAVOH composite filament containing 6% MWCNT was produced by IPCB-CNR team using solvent wrapping method. Due to formation of a hexagonal structure of MWCNTs, a very high electrical conductivity (of 1.38 S/m) was achieved, in contrast to the filament produced by melt extrusion.
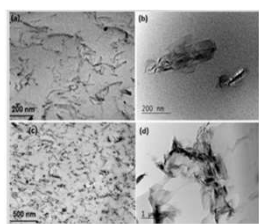

IMECH-BAS team has proposed the essential structural parameters that govern the properties of PLA/MWCNT/GNP nanocomposites, such as:
- Percolation threshold;
- Intrinsic characteristics of nanofiller: nature, aspect ratio, shape and size;
- Filler dispersion and distribution in the polymer.

Local Enrichment Strategy was proposed by Sichuan team to prepare PLA/GNP filament with segregated structure and highly efficient electrical and EMI properties. The 3D printing process was simulated by FES, allowing to keep the segregated filler network structure and thus, to achieve similar properties of the 3D printed parts.
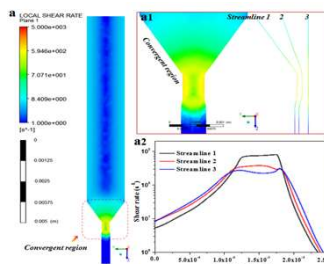
WP5, D5.1. Robust nanocomposite design tool:
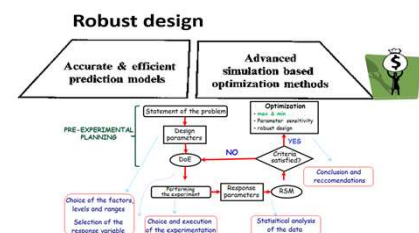
Robust design tool was developed by UniSa. A pre-planning phase for collecting experimental data was considered, The design tool was proven for prediction of electrical conductivity as a function of two filler contents. The design toll will be exploited with more levels in the second part of the Graphene 3D project

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Progress of secondments in 2017-2019:

Completed for 36 months	Funded by EC for 48 months
80 Seconded Researchers **145** Researcher Declarations	**367** Total Researcher Months **181** Researcher Declarations

Dissemination of Project Results in 2017-2019:

- Project publications in IF journals: **50** vs.>20 in KPIs
- Open access publications: **21** vs.>10 in KPIs
- Conference Presentations **17,** Invited talks **18** vs.>10 in KPIs
- Internal Seminars with Seconded Researchers: **7**

Project Events in 2019:

o Training School for ESRs – "Advanced methods for characterization of graphene-based nanocomposites" was held on 26-30 May, in Salerno, Italy and was hosted by the project partner UniSa. More than 30 ESRs and ERs took place in the school. The program included lectures given by external top researchers and ERs from some project partners. In the afternoons, the ESRs were trained in laboratories at UniSa. In the last day, all participating ESRs have prepared personal reports on their experimental results. Three ESRs won the "best poster" competition and received awards.

o Workshop on "Polymer Nanocomposites for 3D-printing of Enhanced Porous Structures" was held on October 3-4 in Centro Polifunzionale Paradiso of Anacapri, Capri (Italy) The Workshop was organized by ICPB,CNR partner; it involved about 45 participants. Two plenary lectures were delivered by invited experts (Dr. Ian Kinloch from the University of Manchester, UK and Dr. Jochen Schmidt from the Friedrich-Alexander-University of Erlangen-Nürnberg, Germany). Invited talks were delivered also by speakers from CNR, the University of Salerno, and the company 3DnA Srl., Italy. Reports were presented by ERs (7 talks) and by ESRs (8 talks) from the Graphene 3D Consortium, reporting their results within the project. The ESRs took part in a competition for the best 3 oral presentations that have been evaluated by an internal committee. The winners received a certificate and a small present from the Workshop organizers.

o Two MC/MB meetings have been organized: Salerno (30/05/19) and Anacapri (5/10/19). Since October 2019, the Secondment Manager is Dr. Maria Gelli and the WP3 leader – Dr. Giovanna Buonocore.

Upcoming Events:

The Final Workshop and Final MB/MC Meeting "Outcomes from the Graphene 3D project" will be held on Sept. 23-26, 2020 in Tbilisi.

WP Leaders:

WP1: Project Management and Coordination
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WP2: Processing and rheological control of nanocomposites
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WP3: Characterization of hybrid structure and morphology
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WP4: Characterization of nanocomposite properties around percolation threshold
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WP5: Robust nanocomposite design and optimization of material's formulation
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WP6: Modeling, simulation and optimization of nanocomposite cellular structures
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WP7: Prove of design concept by experimental validation of 3D printed cellular structures.
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WP8: Dissemination, exploitation of results § communication.
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WP9: Ethics requirements
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