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# Polymer Meeting 14

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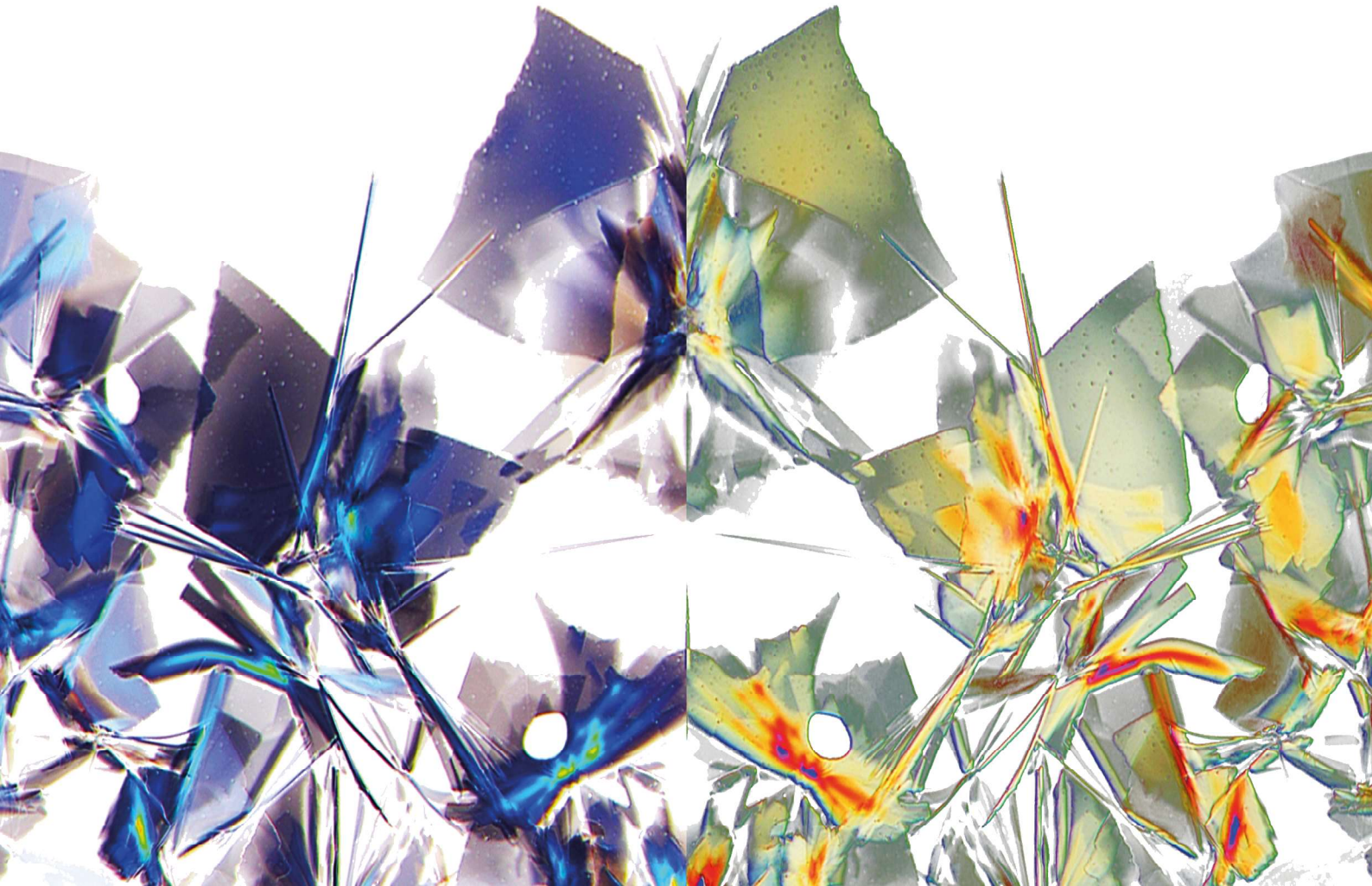
## BOOK OF ABSTRACTS



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# Polymeric composites and hybrids with 2D nanofillers

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The isolation of graphene and its special properties has stimulated interest in other free-standing two-dimensional (2D) nanoparticles. The current intense interest about 2D materials is due to their unique properties resulting from their structure. In the last decade the fast-growing family of 2D nanomaterials are MXenes. MXenes are inorganic materials, transitional metal carbides, nitrides or carbonitrides. Different MXenes are prepared from different MAX phases of the formula $M_{n+1}AX_n$, where M is the most common transition metal, A is an element of the 13 or 14 group of the periodic table of elements, X is usually C and/or N[1]. By etching of the A layers from MAX phase, MXene are formed. General formula of MXenes is $M_{n+1}X_n$.

Carbon nanotubes (CNT), which are tubular structures rolled as cylinders and have nanoscale diameter, possess excellent physical and mechanical properties CNT have been widely used as filler for different kinds of polymers nanocomposite preparation. Hybrids can be created by combination of 2D nanosheets with zero-dimensional nanoparticles as quantum dots, or 1D nanoparticles as CNT. This combination used in polymeric composites provides interesting 3D structures and properties. We studied the incorporation of MXene and perovskite quantum dots (PQDs) monolayer at the charge transfer layer/perovskite active layer interface in planar direct and inverted perovskite solar cells (PSC) as direct application of new prepared hybrids.

Next part of our work was aimed to preparation and characterization of composites where poly(methyl methacrylate) was used as matrix and MXenes and CNT as a conducting fillers. In PMMA/CNT, PMMA/MXenes, and PMMA/MXenes/CNT composites the range of fillers varied from 0.5 to 10 wt. %. Composites were prepared by solvent casting method. The higher the MXene amount, the higher the final conductivity of polymeric composites, but highest value of conductivity was about $10^{-7}$ S/cm. Much higher conductivity was achieved for composites with hybrid 2D and 1D nanofillers. PMMA/1% MXene/1% CNT, about $10^{-3}$ S/cm. 1D-2D synergized nanostructures are reason for better electrical properties, when compared with composites containing only 2D or 1D fillers.

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