Colloidal Nanocrystals based Advanced Nanocomposite Materials

M. Striccoli *
CNR -Institute for Physical and Chemical Processes, IPCF, Bari (Italy)
* m.striccoli@ba.ipcf.cnr.it

Keywords: Colloidal nanoparticles, Nanocomposites, Chemical functionalization, Patterning

In the last years, significant research effort has been devoted to design, fabricate and exploit nanocomposite materials based on colloidal nanoparticles (NPs) embedded in polymer matrix. The extraordinary interest in such materials relies on the large range of properties that can arise from the synergic combination of the features of NPs and host polymer. Indeed, the original size dependent physical and chemical properties of nanomaterials, as semiconductor, metals, oxides and magnetic nanoparticles, and recently perovskites [1] and carbon nanodots, [2] jointly with the high processability and the defined chemistry and morphology of polymers and block co-polymers, finally turn out in innovative patternable materials [3], with high technological impact in a variety of advanced application in different fields such as electronics, energy and storage, sensors and information technologies. The advances in colloidal science have resulted in a variety of preparative and post-preparative protocols that control size, shape and surface chemistry of the synthesized NPs [3]. Functionalization strategies allow to engineer the NP surface chemistry, thus tuning their specific chemical reactivity to match the surrounding environment [4,6]. The incorporation of nano-objects into polymers allows to bridge the gap between nano and meso scale, obtaining scalable structures and enabling the NP integration in systems and devices to fully exploit their original geometry-dependent properties for advanced applications [7]. Here, different approaches will be presented as effective opportunities for conveying colloidal NP properties to polymer-based nanocomposite materials, and for preparing innovative hybrid systems in view of their application in optoelectronic and energy-related fields [1-8].

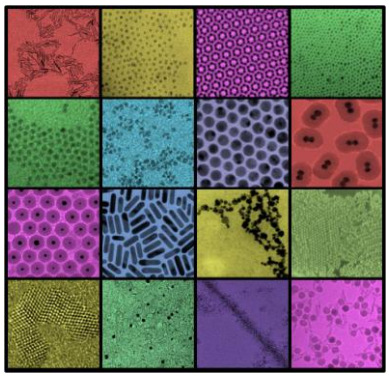

Fig. 1 – TEM micrograph collection of colloidal nanoparticles and composites

References

[1] M. Striccoli et al. Energies 13 (24), 6730 (2020)
[2] M. Striccoli et al. J. Phys. Chem. C 122, 1, 839–849 (2018)
[3] M. Striccoli et al. Materials 3, 1316 (2010)
[4] M Striccoli et al. ACS Applied Materials & Interfaces 6, 11805 (2014)
[5] M- Striccoli et al. Small 3, 822 (2007)
[6] M. Striccoli et al. Nanotechnology 19, 205705 (2008)
[7] M Striccoli, et al. Nanoscale 5, 6097 (2013);
[8] M. Striccoli et al, Nanoscale 5, 239 (2013)

Acknowledgements:

The Italian MIUR PRIN 2017 Candl2 Project Prot. n. 2017W75RAE is gratefully acknowledged.