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Organically linked nanoparticles as building blocks for architected materials

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Nature presents a lot of examples of complex shaped hierarchical materials, which often consist of nanoscaled building blocks of minerals surrounded by tiny organic shells or vice versa, such as nacre, enamel or bone. Besides their fascinating architected microstructures these biomaterials are attractive because they may have multifunctional or synergistic mechanical properties. Until now however it is very difficult to manufacture macroscopic bioinspired hierarchical materials with promising mechanical properties.

In this talk a processing route is described where functionalized nanoparticles are used as elementary building blocks for a hierarchical material. These elementary building blocks are self-assembled to supercrystals as a first hierarchical level of the material [1]. By changing the ligands the mechanical properties of this first hierarchical layer can be varied. These supercrystals are arranged in a second hierarchical level by thermodynamic phase separation or the application of the spouted bed method [2]. The microstructure and mechanical properties of these hierarchical nanocomposites are discussed.

Acknowledgments

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References

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- [2] Brandt K., Wolff M.F.H., Salikov V., Heinrich S., Schneider G.A., 2013, A novel method for a multi-level hierarchical composite with brick-and-mortar structure, *Scientific Reports*, DOI: 10.1038/srep02322 1