UNIVERSITÄT DUISBURG ESSEN

PHYSIK E=

Physikalisches Kolloquium

Mittwoch, 22.11.2023
13:00 Uhr
MC 122

Make it with minerals: reactive crystallizations for self-organizing

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Inspired by natural and biologically controlled mineralization processes, we explore in this talk a range of simple physical chemical phenomena to make complex materials. We use chemical gradients and light patterns to direct the self-organization of minerals into exact user-defined patterns and shapes. Then, we customize the chemical composition using ion-exchange reactions, while preserving the initially programmed patterns and shapes. This opens new routes for organizing advanced functional mineral components using bioinspired mineralization strategies.

1. W. L. Noorduin, A. Grinthal, L. Mahadevan, J. Aizenberg, “Rationally Designed Complex, Hierarchical Microarchitectures”, Science, 340, 832, 2013
2. A. van der Weijden, A.-S. Léonard, W.L. Noorduin "Architected metal selenides via sequential cat- and anion exchange on self-organizing nanocomposites" Chemistry of Materials 35, 2394–2401, 2023.
3. M. Bistervels, B. Antalicz, M. Kamp, H. Schoenmaker, W.L. Noorduin “Light-driven nucleation, growth, and patterning of biorelevant crystals using resonant near-infrared laser heating” Nature Communications accepted 2023.
4. M. H. Bistervels, M. Kamp, H. Schoenmaker, A. M. Brouwer, W. L. Noorduin “Light-controlled nucleation and shaping of self-assembling nanocomposites” Advanced Materials, 34, 210784, 2022.