

Nanomaterials innovations at Empa: From high thermal insulation plasters to atomically precise engineered electronic materials.

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Nanostructured materials are one of the five focus research areas of Empa and represent an enabling topic for the other four areas being: Energy, Natural Resources and Pollutants, Health and Performance and Sustainable Built Environment. Within its mission to promote innovation by bridging academia and industry, Empa is working on a large number of technologies involving nanomaterials at different levels of technological readiness.

In my presentation I will outline different examples of nanomaterial related technologies in various stages of maturity, ranging from already commercialized applications to fundamental research at the limit of material science, i.e. the engineering of materials properties by atomically precise synthesis.

In relation to the latter, I will particularly discuss the on-surface synthesis and characterization of graphene related nanostructures in particular graphene nanoribbons (GNR) as active elements for electronic applications. The electronic properties of graphene GNRs vary largely as a function of their atomic structure. This is a blessing and a curse at the same time, as it offers a great flexibility in engineering these properties on one hand. Yet, it also requires synthesis with atomic precision in order to achieve homogenous properties through the material. I will discuss how this precision can be achieved using bottom-up, on-surface chemical synthesis using rationally designed molecular precursors.