NANOSCIENCE COLLOQUIUM

Fast Electrons and Hard X-rays for Unraveling Atomic-Scale Dynamics in Light-Energy Conversion

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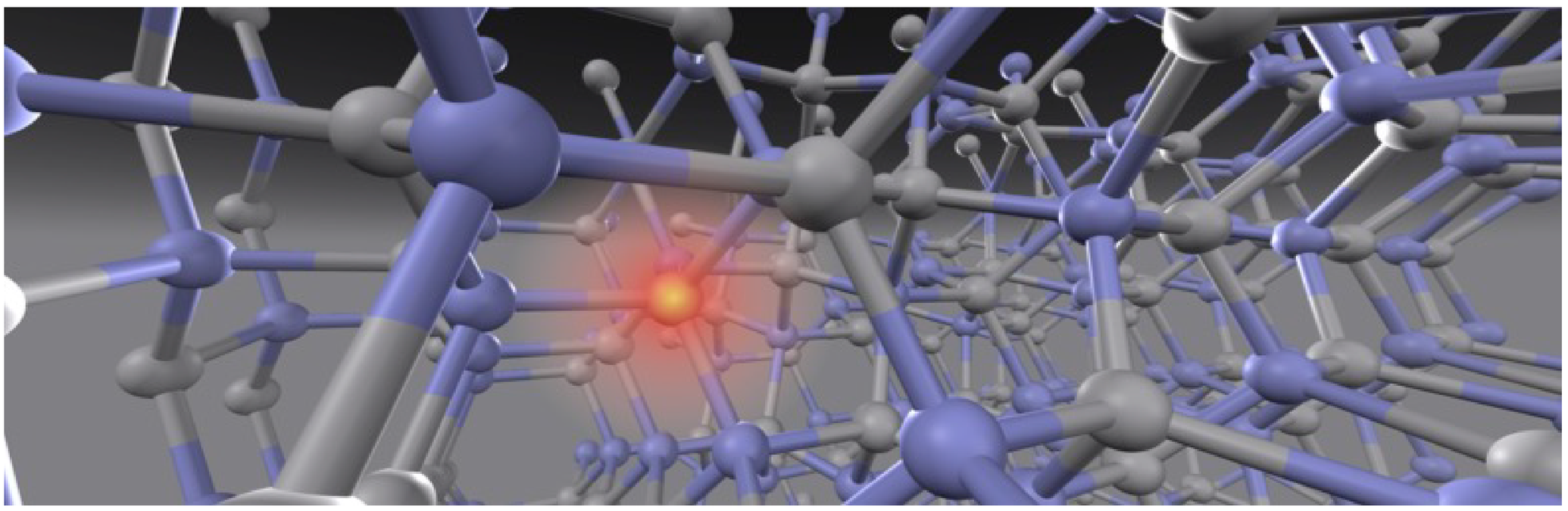
Abstract:
The increasing demand for renewable and low-cost energy motivates intensive research aimed at characterizing and optimizing materials that can efficiently convert (sun) light into usable energy in the form of electricity or chemical fuels. Conventional characterization techniques either lack the spatial resolution necessary to resolve individual atoms, or they lack the temporal resolution required to capture structural rearrangements as they evolve. Our group develops complementary X-ray and electron-based tools to visualize light-induced processes in materials on atomic length and time scales. We apply our methods to the study of, for example, carrier dynamics in heterostructured nanomaterials relevant for solar energy applications, restructuring dynamics of nanocatalysts, or excited-state dynamics of molecular photocatalysts for bond-forming reactions in organic synthesis. The direct time-resolved insights in electronic and structural dynamics obtained are a prerequisite for the rational control and bottom-up design of materials optimized for light harvesting.



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