

# Light-induced Structural Control in Nanocrystals

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In this talk, I will discuss a new frontier in material characterization, specifically pump-probe techniques that utilize pulsed electron as X-ray sources as probes to investigate atomic motion, structural order and disorder under excited state conditions on picosecond timescales. Additionally, I will present related structural analysis and modeling approaches. During the talk, recent research from our team will be showcased on engineering hot-plasmon dynamics in metal nanoparticles [1], Auger heating and surface trapping in semiconductor quantum dots [2], polaron formation dynamics in halide perovskites [3], and photothermal responses in 2D MXenes [4]. Moreover, I will highlight a novel approach to dynamic material control using light, and discuss how photoexcitation can be used to manipulate structural symmetry, phase and domains in nanoscale, quantum materials on sub-nanosecond timescales [5, 6].

## **References**

- [1] B. Guzelturk et al., ACS Nano 14, 4792 (2020).
- [2] B. Guzelturk et al., Nature Communications 12, 1860 (2021).
- [3] B. Guzelturk et al., Nature Materials 20, 618 (2021).
- [4] B. Guzelturk et al., Nano Letters 23, 2677 (2023)
- [5] B. Guzelturk et al., Advanced Materials 35, 2306029 (2023).
- [6] B. Guzelturk et al., in-preparation (2024).