세미나 초록

성명	김동하
소속	한양대학교 에리카 재료화학공학과
발표 주제	나노소재의 표면 활성 제어를 통한 촉매/센서 응용
발표 내용	Momentary thermal annealing techniques based on the generation of photo-excited electrons have been applied for ultrafast optical sintering in carbon, metal, and narrow-bandgap oxides. When a material is irradiated with sufficiently intense light, the incident photons interact with the material's electrons, inducing energy transfer through photothermal conversion pathways. This process enables selective area annealing and ultrafast annealing with rapid heating/cooling rates. We propose an ambient-air flash-thermal shock (FTS) momentary high-temperature annealing technique via intense pulsed light (IPL) irradiation. This method induces markedly enhanced photothermal conversion effects, enabling highly efficient optical sintering of various nanomaterials, including metal oxides, graphene oxide, carbon nanofibers, and MXenes. The generated heat can tune the phase and defects of support materials and facilitate the *in-situ* synthesis and stabilization of catalysts on their surfaces. Remarkably, ultrafast heating/cooling rates (>10^4K/s) and high temperatures (>2000K) enable the uniform synthesis of high-entropy alloy nanoparticles, driven by thermodynamic and kinetic factors. Additionally, applying multiple FTS cycles after the formation of catalytic nanoparticles can break these NPs down to single atoms. Our method paves a new way for fabricating various catalyst-loaded nanomaterials, which are crucial for applications requiring superior surface activity. Specifically, we demonstrated the development of high-performance chemical sensors.