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Simple Synthetic Approach to Advanced Nanomaterials

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Advanced metal oxide nanomaterials play many important roles in the fields of Chemistry. Physics, Engineering, and Medicine, etc. Therefore the development of simple solvothermal methods for the synthesis of advanced metal oxide nanomaterials has become a frontier in science and technology.

Recently, binary metal oxide nanoassemblies received much attention due to their advantageous synergistic effects. To this end, we developed a simple synthetic method to obtain CeO2–ZrO2 spherical nanoassemblies. The nano-structure and atomic ratio of the CeO2–ZrO2 nanoassemblies were easily controlled to obtain homogeneously mixed CexZr1-xO2, CeO2–ZrO2 domains, ZrO2@CeO2 core-shells. Moreover, Al2O3–TiO2 and ZnO–TiO2 hollow spherical nanoassemblies were also synthesized. Al2O3–TiO2 nanoassemblies possessed high heat tolerance properties while ZnO–TiO2 nanoassemblies showed tunable bandgap energy.

On the other hand, wide band gap insulator materials such as alkali earth metal oxides are being widely utilized in scientific and technological applications. However, typical solvothermal methods are unable to afford alkali earth metal oxides. We successfully obtained MgO nanomaterials by solvothermal reaction in supercritical acetonitrile. For the first time in the world, metal oxide nanomaterials synthesis using supercritical acetonitrile as a reaction medium was successfully demonstrated in this research.

Thus, single-step simple solvothermal synthesis of advanced mixed metal oxide nano materials and MgO nanomaterials was successfully demonstrated.

主催：九州大学　最先端有機光エレクトロニクス研究センター
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