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## **Hydrothermal synthesis of cerium oxide nanoparticles stabilized with citric acid**

Cerium oxide nanoparticles (NP CeO<sub>2</sub>) are a promising material, due to their unique physical and chemical properties and photocatalytic activity. NPs CeO<sub>2</sub> have low toxicity and high stability, they can easily enter into redox reactions. Cerium ions in NPs CeO<sub>2</sub> can exist in one of two oxidation states (Ce<sup>3+</sup> and Ce<sup>4+</sup>) on the NP surface, and highly mobile oxygen vacancies in the lattice allow cerium ions to freely and reversibly alternate oxidation states [1]. Due to this interchange, CeO<sub>2</sub> NPs exhibit more powerful antioxidant activity than traditional antioxidants. In recent years, the use of CeO<sub>2</sub> NPs for various biomedical applications has been of greatest interest.

In order to maintain a stable nanoparticle size, it is necessary to confine the surface with stabilizing molecules. This will also help to maintain colloidal stability over a long period of time. Various organic acids are used as a stabilizer for CeO<sub>2</sub> NPs. The negative charges on the carboxyl groups act as repulsive agents between the cerium oxide nanoparticles, creating a stable colloidal sol.

Thus, it is important to develop a reliable synthesis method for the production of stable ultra-small CeO<sub>2</sub> NPs. This is necessary to achieve positive and meaningful results in biomedical applications. In this work, we report the production of CeO<sub>2</sub> NPs stabilized with citric acid by the hydrothermal method. The hydrothermal method was used as a most promising for obtaining ultra-small NPs CeO<sub>2</sub> with a narrow size distribution (2–10 nm). The effect of citric acid concentration on the size and stability of the obtained CeO<sub>2</sub> NPs is shown.

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- 1) Nyoka, M., Choonara, Y. E., Kumar, P., Kondiah, P. P., & Pillay, V. (2020). Synthesis of cerium oxide nanoparticles using various methods: implications for biomedical applications. *Nanomaterials*, 10(2), 242.