# Article information:

Crystallization kinetics of cerium oxide nanoparticles formed by spontaneous, room-temperature hydrolysis of cerium(iv) ammonium nitrate in light and heavy water - Physical Chemistry Chemical Physics (RSC Publishing)
<https://pubs.rsc.org/en/content/articlelanding/2017/cp/c6cp08227k>

# Article summary:

1. Cerium oxide nanoparticles can form spontaneously when cerium(IV) ammonium nitrate (CAN) is dissolved in room-temperature water at mM concentrations.

2. The crystallization kinetics of the nanoparticles were studied and it was found that they are formed roughly an order of magnitude more slowly in D2O than in H2O solution, indicating a rate-determining proton transfer reaction.

3. The study sheds light on the poorly understood events that cause molecularly solvated ions to self-assemble into nanocrystals, following hydrolysis.

# Article rating:

May be slightly imbalanced: The article presents the information in a generally reliable way, but there are minor points of consideration that could be explored further or claims that are not fully backed by appropriate evidence. Some perspectives may also be omitted, and you are encouraged to use the research topics section to explore the topic further.

# Article analysis:

The article discusses the crystallization kinetics of cerium oxide nanoparticles formed by spontaneous, room-temperature hydrolysis of cerium(iv) ammonium nitrate in light and heavy water. The study reveals that the nanoparticles are highly crystalline and several nm in diameter, forming from amorphous particles that are similar in size. The absence of particles large enough to scatter light significantly makes it possible to observe the crystallization kinetics through dramatic changes in the UV-visible absorption spectra that occur during solution aging.

The article acknowledges that the molecular events behind the homogeneous nucleation and growth of inorganic crystals and nanocrystals from solution-phase precursors are still unclear. However, it suggests that non-classical mechanisms may be important intermediates along the crystallization pathway. The article also highlights the importance of caution when working with cerium(IV) ammonium nitrate due to its susceptibility to spontaneously form CeO2 nanocrystals under mild reaction conditions.

Overall, the article appears to provide a balanced analysis of the research findings without any apparent biases or unsupported claims. However, it is worth noting that some counterarguments or alternative perspectives on non-classical nucleation pathways could have been explored further for a more comprehensive analysis. Additionally, while potential risks associated with working with cerium(IV) ammonium nitrate are noted, further discussion on safety measures could have been included for a more informative read.

# Topics for further research:

* Non-classical nucleation pathways in inorganic crystal formation
* Mechanisms of homogeneous nucleation and growth of nanocrystals
* Safety measures for working with cerium(IV) ammonium nitrate
* Properties and applications of cerium oxide nanoparticles
* Synthesis methods for cerium oxide nanoparticles
* Characterization techniques for nanocrystals and their crystallization kinetics

# Report location:

<https://www.fullpicture.app/item/da8ea4afe63f9ed7d4d18a30865f063b>