

## Accepted Manuscript

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PII: S0001-8686(16)30016-1  
DOI: doi: [10.1016/j.cis.2016.01.005](https://doi.org/10.1016/j.cis.2016.01.005)  
Reference: CIS 1618

To appear in: *Advances in Colloid and Interface Science*

Received date: 5 September 2015  
Revised date: 13 January 2016  
Accepted date: 20 January 2016



Please cite this article as: Qiao Liang, Swihart Mark T., Solution-Phase Synthesis of Transition Metal Oxide Nanocrystals: Morphologies, Formulae, and Mechanisms, *Advances in Colloid and Interface Science* (2016), doi: [10.1016/j.cis.2016.01.005](https://doi.org/10.1016/j.cis.2016.01.005)

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# Solution-Phase Synthesis of Transition Metal Oxide Nanocrystals: Morphologies, Formulae, and Mechanisms

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## ABSTRACT

In this review, we provide a broad overview of solution-phase synthesis of transition metal oxide nanocrystals, including a substantial catalog of published methods, and a unifying classification and discussion. Prevalent subcategories of solution-phase synthesis are delineated and general features are summarized. The diverse morphologies achievable by solution-phase synthesis are defined and exemplified. This is followed by sequential consideration of the solution-phase synthesis of first-row transition metal oxides. The common oxides of Ti, V, Mn, Fe, Co, Ni, Cu, and Zn are introduced; major crystal lattices are presented and illustrated; representative examples are explained; and numerous synthesis formulae are tabulated. Following this presentation of experimental studies, we present an introduction to theories of NC nucleation and growth. Various models of NC nucleation and growth are addressed, and important concepts determining the growth and structure of colloidal NCs are explained. Overall, this review provides an entry into systematic understanding of solution-phase synthesis of nanocrystals, with a reasonably comprehensive survey of results for the important category of transition metal oxide NCs.

## Keywords

Solution-phase synthesis

Transition metal oxide

Nanocrystal

Formula

Mechanism

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