



HAL
open science

Synthesis of Molybdenum Oxide and Sulfide Nanoparticles at Room Temperature Using Organometallic Approach

Martin Jakoobi, Guillaume Carnide, Laure Vendier, Christian Bijani, Anne-Françoise Mingotaud, Richard Clergereaux, Myrtil L Kahn

► **To cite this version:**

Martin Jakoobi, Guillaume Carnide, Laure Vendier, Christian Bijani, Anne-Françoise Mingotaud, et al.. Synthesis of Molybdenum Oxide and Sulfide Nanoparticles at Room Temperature Using Organometallic Approach. Proceedings, 2023, Proceedings of International Conference EcoBalt 2023 "Chemicals & Environment", 92 (1), pp.47. 10.3390/proceedings2023092047 . hal-04757665

HAL Id: hal-04757665

<https://hal.science/hal-04757665v1>

Submitted on 29 Oct 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

Synthesis of molybdenum oxide and sulfide nanoparticles at room temperature using organometallic approach [†]

Martin Jakoobi ^{1,*†}, Guillaume Carnide ¹, Laure Vendier ¹, Christian Bijani ¹, Anne-Françoise Mingotaud ², Richard Clergereaux ³ and Myrtil L. Kahn ^{1,*†}

¹ Laboratory of Coordination Chemistry (LCC), CNRS UPR 8241, University of Toulouse, 205 Route de Narbonne, 31077 Toulouse, France

² Laboratoire des IMRCP, Université de Toulouse, CNRS UMR 5623, Université Paul Sabatier, 118, route de Narbonne, F-31062 Toulouse, Cedex 09, France

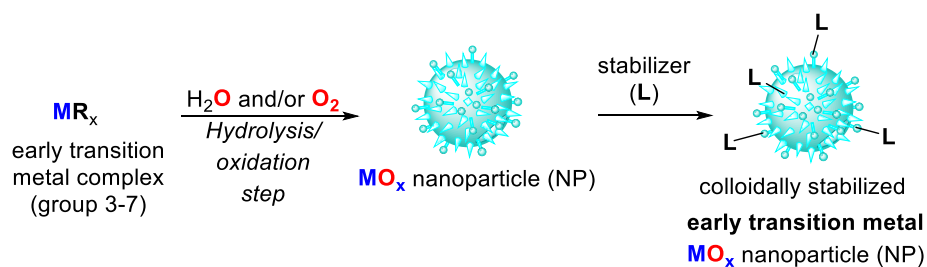
³ LAPLACE, CNRS UMR5213, Université de Toulouse, 118 route de Narbonne, 31062, Toulouse, France

[†] Presented at the International Conference EcoBalt 2023 "Chemicals & Environment", Tallinn, Estonia, 09 – 11 October 2023.

Keywords: organometallic approach; nanoparticles; mild conditions; size control; colloidal stability; molybdenum oxide, molybdenum sulfide

In the early 1990s, the seminal work by B. Chaudret and J. S. Bradley led to the establishment of metal nanoparticles (NPs) synthesis from organometallic precursors. Since then, this methodology has attracted the attention of many research groups, ours included, and offered possibilities to selectively control the shape and size of these nano-objects under mild reaction conditions. Clever design of substrate and stabilizing ligand systems has allowed the synthesis of late transition metal and their oxide NPs (group 8-12) from precious metal (Ru, Rh, Pd, Pt, Ag, Au) and from first-row (Fe, Co, Ni, Cu, Zn) metal complexes [1,2]. However, to this day, the development of suitable early transition metal complexes (group 3-7) for the preparation of corresponding oxide, sulfide, etc. NPs has attracted only sporadic attention.

This presentation will focus on the use of highly reactive Mo(0) complex for the synthesis of molybdenum oxide and sulfide NPs at room temperature. These results will illustrate how the choice of the substrate, stabilizing ligand and solvent system can lead to stable colloidal NPs with a diameter of <10 nm in size (Scheme 1) [3].



Scheme 1. Synthesis of early transition metal oxide NPs using organometallic approach.

References

1. Amiens, C.; Chaudret, B.; Ciuculescu-Pradines, D.; Collière, V.; Fajerweg, K.; Fau, P.; Kahn, M.; Maisonnat, A.; Soulantica, K.; Philippot, K. Organometallic approach for the synthesis of nanostructures. *New J. Chem.* 2013, 37, 3374-3401.
2. Cerezo-Navarrete, C.; Lara, P.; Martínez-Prieto, L.M. Organometallic Nanoparticles Ligated by NHCs: Synthesis, Surface Chemistry and Ligand Effects. *Catalysts* 2020, 10, 1144.
3. Jakoobi, M.; Carnide, C.; Vendier, L.; Bijani C.; Mingotaud, A.-F.; Clergereaux, R.; Kahn, M. L. Manuscript in preparation.