Vilnius
Ch
2025

CHEMISTRY AND CHEMICAL TECHNOLOGY 2025

Student Scientific Conference

May 9, 2025
NFTMC, Saulėtekio al. 3,
Vilnius

Vilniaus universitetas 1579 Universitas Vilnensis

ktu kauno technologijos universitetas 1922

Klaipėdos universitetas

CENTER FOR PHYSICAL SCIENCES AND TECHNOLOGY

Scientific committee

Doc. dr. Lina Mikoliūnaitė | VU (chairwoman)

Prof. dr. Aldona Beganskienė | VU

Doc. dr. Živilė Stankevičiūtė | VU

Doc. dr. Inga Grigoravičiūtė | VU

Doc. dr. Vaida Kitrytė-Syrpa | KTU

Prof. dr. Vytautas Getautis | KTU

Prof. dr. Saulius Grigalevičius | KTU

Doc. dr. Vilija Kederienė | KTU

Dr. Tadas Prasauskas | KTU

Dr. Žilvinas Kryževičius | KU

Prof. dr. Audronė Žukauskaitė | KU

Organizing committee

Dr. Lina Mikoliūnaitė | VU (chairwoman)

Dr. Greta Inkrataitė (secretary) | VU

Dr. Živilė Stankevičiūtė | VU

Dr. Inga Grigoravičiūtė | VU

Dr. Julija Grigorjevaitė | VU

Dr. Indrė Misiūnaitė-Vaškevičienė | VU

Dr. Anton Popov | VU

Dr. Agnė Kizalaitė | VU

PhD stud. Eglė Ežerskytė | VU

PhD stud. Gytautė Sirgėdaitė | VU

PhD stud. Justinas Januškevičius | VU

ISSN 2538-7332 (digital), DOI https://doi.org/10.15388/CCT.2025

SOL-GEL SYNTHESIS: FROM BASICS TO PRACTICAL APPLICATION

Dovydas Karoblis[1*], Evaldas Lugauskas[1], Pranga Prava Mandal[1], Aigul Dastankyzy[1], Aivaras Kareiva[1]

[1]Institute of Chemistry, Vilnius University, Naugarduko 24, LT-03225, Lithuania

Many inorganic materials, such as oxides, carbides or nitrides, can be prepared by simply mixing starting materials and heating the mixture at elevated temperatures. While this method is relatively straightforward and feasible due to the availability of high temperature furnaces, it suffers from several drawbacks: it requires multiple heating and grinding steps and makes it difficult to achieve a homogeneous distribution of the starting materials due to limited mass transport. One of the synthesis methods that can overcome these difficulties is sol-gel synthesis [1]. This technique allows for atomic-level mixing of starting materials, which ensures possible formation of ternary, quaternary or even more complex structures containing more than four elements.

Sol-gel chemistry involves the creation of ceramics or inorganic polymers from solution by gradually converting liquid precursors into a sol and then into a network structure – gel. There are two types of precursors that can be used in this synthesis, namely metal alkoxides as well as hydrated metal species with small molecules, like citric acid. Many metal alkoxides are unstable in water and tend to form precipitates, which limits their practical application. For that reason, sol-gel synthesis is often conducted in aqueous solutions, using various chelating agents. Moreover, this synthesis is highly versatile, and different modifications, like sol-gel combustion or sol-gel synthesis using different monomers, can also be used.

This work focuses on the preparation of various classes of inorganic materials, including perovskites and spinel structure compounds. Three different sol-gel modifications were used to prepare these materials, namely sol-gel combustion [2], Pechini sol-gel [3, 4] and the sol-gel polyacrylamide-route. Structural, morphological and magnetic properties were characterized for all samples.

References

1. A. E. Danks, The evolution of ‘sol-gel’ chemistry as technique for materials synthesis, 2016, **3(2)**, 91, 91-112.
2. D. Karoblis, Novel synthetic approach to preparation of single-phase BixLa1-xMnO3+δ solid solutions, 2020, **93**, 650-656.
3. D. Karoblis, Sol-gel synthesis, structural, morphological and magnetic properties of BaTiO3-BiMnO3 solid solutions, 2020, **46.10**, 16459-16464.
4. D. Karoblis, Study of gadolinium substitution effects in hexagonal yttrium manganite YMnO3, 2021, **11(1)**, 2875.