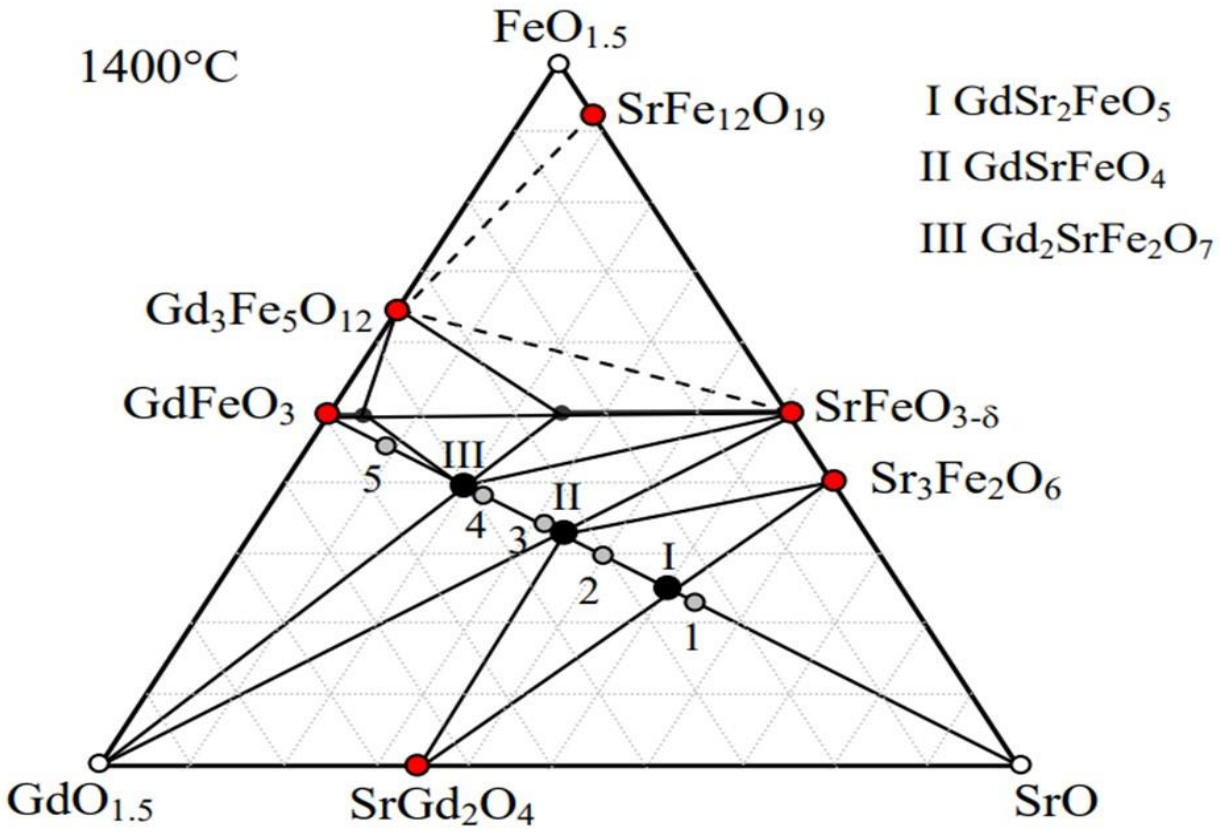
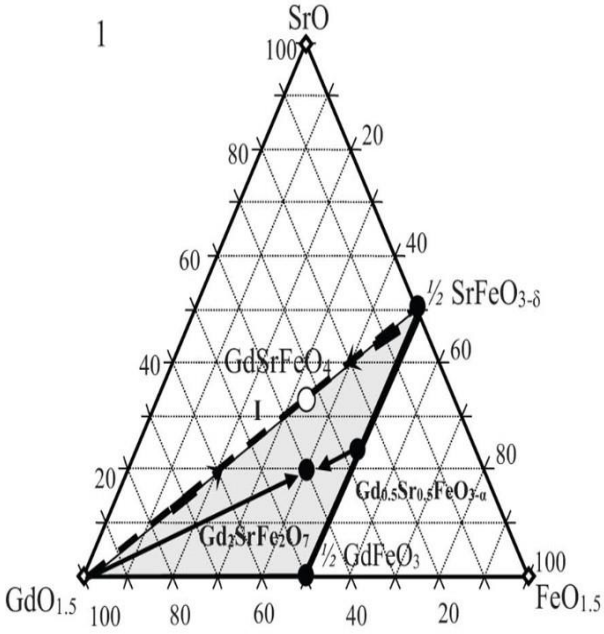
Brief information about the project

Name of the project	AP09058268 «Physicochemical design of new complex rare earth oxides for the production of functional materials»
Relevance	In this project, experimental and theoretical studies of the formation of complex oxide phases and the stability of the formed phases in a wide temperature range are proposed, as well as a study of the effect of the formed compound structure and the conditions of synthesis on the properties of the obtained materials. The main idea of the project is to identify dependences of the composition-structure-property for crystalline complex oxide compounds containing REE, and to study multifunctional properties depending on the morphological characteristics of materials.
Purpose	Physicochemical design of new complex oxide compounds in the Ln2O3-MeO-Me2O3 system (Ln=La,Gd,Dy; Me=Cr,Fe,Ni). The achievements of the project will lead to the determination of the mechanisms and kinetic parameters of the synthesis of compounds under various conditions, the possibility of the formation of crystalline oxide phases with given morphological characteristics
Objectives	1) Search for new compounds in the Ln2O3-MeO-Me2O3 system (Ln = La, Gd, Dy; Me = Cr, Fe, Ni) by high-temperature solid-phase and hydrothermal methods. 2) Construction of phase diagrams of Ln2O3-MeO-Me2O3 systems (Ln = La, Gd, Dy; Me = Cr, Fe, Ni), including theoretical calculations of phase equilibrium lines to obtain possible phase compositions of complex oxide compounds. 3) Physicochemical design of new materials, physicochemical analysis of phase stability and determination of mechanisms and kinetic parameters of the synthesis of compounds under different conditions.
Expected and achieved results	Work was carried out to study the mechanism of formation and kinetics of synthesis of crystalline oxide phases under different conditions and to characterize the fundamental composition-structure-property patterns in complex oxide compounds containing rare earth elements. Considering the data obtained on optimal synthesis conditions for the structure and properties, recommendations were developed and a method for obtaining these materials was proposed. Scientific results obtained within the framework of the project will help to understand the mechanism of the formation of oxide crystalline phases of rare earth elements and the synthesis of new complex oxides, promising in photocatalysis, photovoltaics, and optics
Research team members with their identifiers (Scopus Author ID, Researcher ID, ORCID,	Kenges Kairat ORCID: https://orcid.org/0000-0001-6408-6083 Scopus Author ID: 57197734961 ResearcherID: AAV-5793-2020

if available) and links to relevant profiles	Satybaldiyev, Bagdat ORCID: https://orcid.org/0000-0003-3434-7291 Scopus Author ID: 55970118000 ResearcherID:DOP-7533-2022 Orazov Zhandos ORCID: https://orcid.org/0000-0002-6562-6093 Scopus Author ID: 57226807984 Zholdas Yerassyl ORCID:https://orcid.org/0000-0002-5405-2389 Scopus Author ID: 57970652700 ResearcherID:HHJ-9854-2022
List of publications with links to them	https://www.degruyter.com/document/doi/10.1515/chem-2023-0170/html Kenges, K. M., & Tugova, E. A. (2023). Strategies for optimizing the single GdSrFeO4 phase synthesis. Open Chemistry, 21(1), 20230170. https://bulletin.chemistry.kz/index.php/kaznu/article/view/1335 Kenges, K. M., Popova, V. F., & Tugova, E. A. (2023). Фазовые соотношения в системе SrO–GdO1. 5–FeO1. 5. Chemical Bulletin of Kazakh National University, 109(2-3), 12-18.
Patents	Application for a patent of the Republic of Kazakhstan for a utility model “Method for producing a $GdFe_{1-x}Cr_xO_3$ solid solution by mechanochemical activation”, application No. 2023/1054.2

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SrO
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60
40
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½ SrFeO3-δ
GdSrFeO4
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FeO1.5
100
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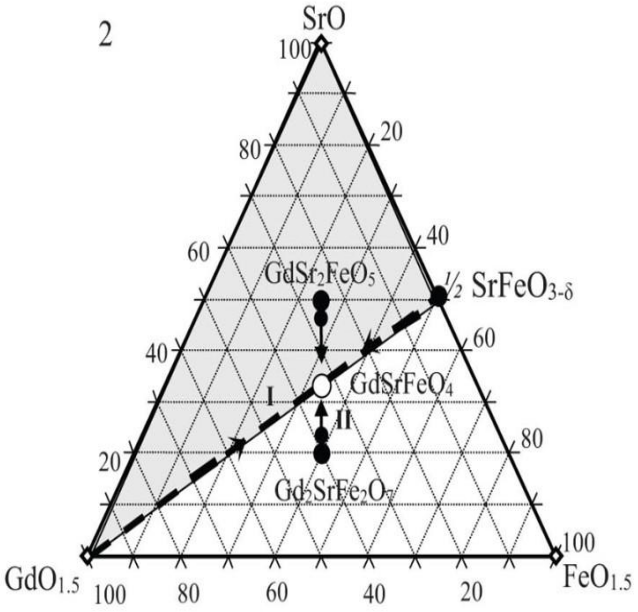
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GdSr2FeO5
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GdSrFeO4
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II
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GdO1.5
FeO1.5
100
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