PhD STUDIES COURSE UNIT DESCRIPTION

Name of subject	Field of science, code	Faculty / Center	Department
Structure of solids and their research methods	Chemistry N 003	Faculty of Chemistry and Geosciences, Institute of chemistry	Departments of Inorganic Chemistry
Student's workload	**Credits**	**Student's workload**	**Credits**
Lectures		Consultations	3
Independent study	7	Seminars	

Course annotation
Solid-state concept, types and characteristics. Amorphous, quasi-crystalline, crystalline materials. Principals of crystallography. Ideal and real crystals. Defects in the crystalline structure and the causes of their formation. Defect classification. Crystallization processes. Homogeneous and heterogeneous crystallization. Form of crystal growth and decay. Crystal morphology, reflection of internal structure defects in it. Properties of polycrystalline solids. Recrystallization, conditions required for the recrystallization process. Thin layers, their growth mechanisms. The concept of texture. Structure of solids, its sensitive and insensitive properties, influence of crystal structure defects. Use of microscopic, diffractive and spectroscopic methods to study the structure of solids. Scanning and transmission electron microscopy, X-ray spectral analysis. Focused ion beam techniques. X-ray phase analysis. Determination of crystal lattice parameters, internal structure studies. X-ray photoelectron and Auger electron spectroscopy. Tunneling and atomic force microscopy, secondary ion mass spectroscopy.
Reading list
1. Marc De Graef, Michael E. McHenry. Structure of Materials: An Introduction to Crystallography, Diffraction, and Symmetry. Cambridge University Press, 2007. 2. Mario Birkholz with contributions by P. F. Fewster and C. Genzel. Thin Film Analysis by X-Ray Scattering. Pp. xxii+356. Weinheim: Wiley-VCH Verlag GmbH Co., 2005. 3. Ivan V. Markov Crystal Growth for Beginners. Fundamentals of Nucleation, Crystal Growth and Epitaxy. World Scientific Publishing Company, 1995. 4. B.Fultz, J.Howe. Transmission Electron Microscopy and Diffractometry of Materials. Springer, 2007. 5. P.J. Goodhew, J. Humpreys, R.Beanland. Electron Microscopy and Analysis. 3rd ed. Taylor & Francis, 2001. 6. J.F.Watts, J. Wolstenholme. An Introduction to to Surface Analysis by XPS and AES. John Wiley & Sons Ltd, 2003 7. Meyer E., Hug H.J., Bennewitz R. Scanning Probe Microscopy. Springer, 2004.

The names of consulting teachers	Science degree	Main scientific works published in a scientific field in last 5 year period
Valentina Plaušinaitienė	Dr.	1. N. Žurauskienė, S. Balevičius, V. Stankevič, S. Keršulis, J. Klimantavičius, **V. Plaušinaitienė**, V. Kubilius, M. Skapas, R. Juskenas, R. Navickas, Magnetoresistive properties of thin nanostructured manganite films grown by metalorganic chemical vapour deposition onto glass-ceramics substrates, JOURNAL OF MATERIALS SCIENCE , 2018, vol.53, Iss:18, p.12996-13009 2. J. Podhorsky, T. Murauskas, C. Hegemann, D. Graf, T. Fischer, M. Babiak, J. Pinkas, **V. Plausinaitiene,** S. Mathur, A. Abrutis, Z. Moravec. Preparation of Heteroleptic Tin(IV) N,O-beta-Heteroarylalkenolate Complexes and Their Properties as PI-MOCVD Precursors for SnO2 Deposition, EUROPEAN JOURNAL OF INORGANIC CHEMISTRY , 2018, Is:46, p.5027-5035

		3. R. Lukose, **V. Plausinaitiene**, M. Vagner, N. Zurauskiene, S. Kersulis, V. Kubilius, K. Motiejuitis, B. Knasiene, V. Stankevic, Z. Saltyte, M. Skapas, A. Selskis, E. Naujalis. Relation between thickness, crystallite size and magnetoresistance of nanostructured $La_{1-x}Sr_xMn_yO_{3+/-delta}$ films for magnetic field sensors, BEILSTEIN JOURNAL OF NANOTECHNOLOGY, 2019, vol.10, p.256-261 4. R. Lukose, N. Zurauskiene, V. Stankevic, M. Vagner, **V. Plausinaitiene**, G. Niaura, S. Kersulis, S.Balevicius, E. Bolli, A. Mezzi, S. Kaciulis. Room temperature Co-doped manganite/graphene sensor operating at high pulsed magnetic fields, SCIENTIFIC REPORTS, 2019, vol.9, 9497. 5. S. Kuprenaite, V. Astie, S. Margueron, C. Millon, JM Decams, Z. Saltyte, P. Boulet, **V. Plausinaitiene**, A. Abrutis, A. Bartasyte. Relationship Processing-Composition-Structure-Resistivity of LaNiO3 Thin Films Grown by Chemical Vapor Deposition Methods, COATINGS, 2019, vol. 9, Iss: 1, 35. 6. M. Vagner, **V. Plausinaitiene**, R. Lukose, S. Kersulis, M. Talaikis, B. Knasiene, S. Stanionyte, V.Kubilius, K.Motiejuitis, Z. Saltyte, G. Niaura, E. Naujalis, N. Zurauskiene. PI-MOCVD technology of (La, Sr)(Mn, Co)O-3: From epitaxial to nanostructured films. SURFACE & COATINGS TECHNOLOGY, 2020, vol.385, 125287. 7. M. Janulevicius, V. Klimkevicius, L. Mikoliunaite, B. Vengalis, R. Vargalis, S. Sakirzanovas, **V. Plausinaitiene**, A. Zilinskas, A. Katelnikovas. Ultralight Magnetic Nanofibrous GdPO4 Aerogel . ACS OMEGA, 2020, vol.5, p.14180-14185.

Certified during Doctoral Committee session on September 28th, 2021. Protocol No. 610000-KT-142.
Committee Chairman prof. habil. dr. Aivaras Kareiva