

„ZATWIERDZAM”

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KARTA INFORMACYJNA PRZEDMIOTU/ZAJĘĆ
(wersja anglojęzyczna w przypadku przedmiotu/zajęć w j. angielskim)

Name	SYNTEZA CIEKŁYCH KRYSTAŁÓW	SYNTHESIS OF LIQUID CRYSTALS
Kod przedmiotu	WTCCXCSM-SLC	
Język wykładowy	angielski	
Profil studiów	<i>ogólnoakademicki</i>	
Forma studiów	<i>stacjonarne</i>	
Poziom studiów	<i>studia II stopnia</i>	
Rodzaj przedmiotu	<i>wybieralny</i>	
Obowiązuje od naboru	2022/2023	
Forma zajęć, liczba godzin/rygor, razem godz., pkt ECTS	<i>W 14/x, L 16/+, 30 godz., 2 pkt ECTS</i>	
Przedmioty wprowadzające	Basic general chemistry course Initial requirements: the knowledge of principles of chemistry, basic correlations of chemical structure with its physicochemical properties, basic knowledge of quantum chemistry and classical thermodynamics Basic physics course Initial requirements: basic knowledge of principles of optics and electromagnetism and electrical properties of materials Basic organic chemistry course Initial requirements: basic knowledge related to first (BSc or equivalent) level of organic chemistry Basic preparative chemistry laboratories Initial requirements: basic skills in setting up the conventional reaction glass systems, basic skills in reaction work-up and purification of organic compounds	
Semestr/kierunek studiów	<i>II semestr studiów / chemia</i>	
Autor	Płk dr hab. Inż. Przemysław Kula, prof. WAT	
Jednostka organizacyjna odpowiedzialna za przedmiot	Wydział Nowych Technologii i Chemii / <i>Instytut Chemii</i>	
Skrócony opis przedmiotu	Introduction to the field of liquid crystals its main present applications. Introduction to correlations between molecular structure and liquid crystalline properties with special attention to the field of fluorinated organic materials. Short survey over main generations of liquid crystals and main classes of intermediates, their importance and synthesis	
Pełny opis przedmiotu (treści programowe)	Introduction. Liquid Crystals (LCs). Classes of liquid crystals their structures and properties. Anisotropic properties of liquid crystals	

	<p>Applications of LCs. The principles of display's operations. LCD switching modes. Direct View Displays. Projection microdisplays. Reflective vs transmissive microdisplays. Non display applications. Properties of LCs related to LCD technologies</p> <p>Determination of LC phases. Liquid Crystals textures. Polarizing thermomicroscopic measurements. Miscibility study. Phase diagrams. Microcalorimetric measurements. X-ray measurements. Electrooptic and dielectric phase characterization.</p> <p>Liquid Crystals mixtures. Phase transitions, thermodynamics of binary mixtures, ideal mixtures, non additive behavior, CSL equations, LC mixtures formulations</p> <p>Fluorinated LCs. Carbon-Fluorine bond character. Comparison of fluorinated organic materials with non-fluorinated ones. Fluorinated LCs. Sources of fluorinated intermediates and their synthesis. Survey of fluorination methods.</p> <p>Synthesis of Liquid Crystals. Synthesis of main classes of LCs. Synthesis of main intermediates. Designing of synthetic routes of some chosen mesogens. Purification and analytical methods. Synthesis of chiral LC materials.</p> <p>Laboratory classes of Liquid Crystals synthesis. Safety precautions. Multistep synthesis of one compounds from two group of nematic LCs. Characterization of Liquid Crystal phases of obtained product</p>
Literatura	<p>Basic:</p> <p>Sivaramakrishna Chandrasekhar "Liquid crystals" Cambridge University Press 1977</p> <p>Dietrich Demus "Physical properties of liquid crystals" John Wiley & Sons 2009</p> <p>Peter J. Collings "Introduction to Liquid Crystals: Chemistry and Physics" Taylor & Francis 1997</p> <p>Additional:</p> <p>Set of original papers from the synthesis methods used in synthesis of Liquid Crystals.</p>
Efekty uczenia się	<p><i>W1 To know the fundamentals of liquid crystals and the relation between the molecular structure and the properties. K_W03, K_W10</i></p> <p><i>W2 To know the way of designing the multistep organic synthesis K_W04, K_W09</i></p> <p><i>W3 To know the relations between molecular structure and IR, ¹HNMR, UV-VIS, MS spectrums. K_W10</i></p> <p><i>W4 To know the basic organic synthesis methods and techniques and the names of the most common labware and glassware. K_W04</i></p> <p><i>U1 Is able using gathered knowledge, propose methods of synthesis of simple organic compounds. K_U01 K_U11, K_U14</i></p> <p><i>U2 Is able to predict and analyse main side reactions usually present along with main organic reactions. K_U04</i></p> <p><i>U3 Is able to design multistep synthesis and propose the synthesis conditions using available literature and other sources of scientific knowledge. K_U03, K_U10, K_U11, K_U16</i></p> <p><i>U4 Is able to set the organic reaction and purification systems using common labware and glassware. K_U03</i></p>

	<p><i>K1 Is aware of the level of own knowledge and is able to self-correct the directions of the self-education. K_K01</i></p> <p><i>K2 Is able actively and responsibly cooperate in the given group during solving theoretical as well as practical tasks. K_K02 K_K04</i></p> <p><i>K3 Is aware of the importance of the organic chemistry and materials chemistry in science and current society. K_K04</i></p>
<p>Metody i kryteria oceniania (sposób sprawdzania osiągnięcia przez studenta zakładanych efektów uczenia się)</p>	<p>The subject is accepted basing on the positive result of examination procedure.</p> <p>The examination form: written + oral: the solution three chosen problems of the following topics: organic synthesis of LCs, molecular design and LC properties correlations - which are given as a set of problems during the semester.</p> <p>Mark 5 - three comprehensive answers Mark 4.5 - two comprehensive answers and one middling answer Mark 4 - one comprehensive answer and two middling answers or two comprehensive answers</p> <p>Mark 3.5 three middling answers or one comprehensive answer and one middling answer Mark 3 - two middling answers</p> <p>The needful requirement is written laboratory report from the organic synthesis labs according given template. Effects W1, W2, U1, U2, U3, K1, K3 are evaluated during examination. Effects W3, W4, U1, U4, K2 are evaluated during organic synthesis labs.</p>
<p>Bilans ECTS (nakład pracy studenta)</p>	<p>1 Participation in lectures 14 2 Independent study of lecture topics 14 3 Participation in laboratories 16 4 Independent preparation for laboratories 14 5 Participation in consultations 2</p> <p>ECTS hours Total student workload 60 2 Teacher classes: 32 1 Practical activities: 60 2 Activities related to scientific activities: 28 1</p>

autor

kierownik
jednostki organizacyjnej odpowiedzialnej za przedmiot

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Płk dr hab. Inż. Przemysław Kula prof. WAT

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prof. dr hab. inż. Jerzy Choma