Study program: Physics

Course title: Ferroelectric liquid crystals

Teacher: Dr Dušanka Obadović

Course status: Optional

ECTS: 15

Preconditions: none

Learning objectives:

Goal of the course is to gain understanding of fundamentals of ferroelectric liquid crystals, their potential for application and experimental methods used for its research.

Learning outcome:

Students should develop:

- General abilities: using the expert literature and reference data, having knowledge of scientific and expert terminology and methods for research and characterization of ferroelectric liquid crystals.
- Course specific abilities: having knowledge of fundamental theory of liquid crystalline substances that put it in the „soft matter“ group, and specifically ferroelectric liquid crystals. Knowledge on experimental methods directed towards characterization of this specific group of materials and understanding of the most attractive area of its application in industry and display technologies.

Syllabus:

Theoretical teaching

Introduction. Anisotropic liquids: basic types and characteristics. Building blocks, types of organic molecules. Ferroelectric liquid crystals: fundamental characteristics and build. Identification of different liquid crystalline phases (SmA, SmB, SmC, SmD). Phase transition SmA-SmC*. Optical characteristics. Dynamical light scattering. Dielectric characteristics of ferroelectric liquid crystals (Goldstone mode, soft mode, thickness mode). Influence of electric field. Helical pitch change under the influence of electric field, physicochemical factor, dopants, temperature and defects.

Application of ferroelectric liquid crystals. Display cells. Ferroelectric liquid-crystalline cells as optical elements. Storage of information. Application in medicine and veterinary medicine, technology and industry. Ferroelectric liquid crystal displays.

Practical

Experimental methods for liquid crystal research: electronic and polarizing microscopy, spectroscopy (IR, UV, visible), X ray diffraction, calorimetric measurements (DSC, DTA).

Literature

1. D. Obadović, M. Stančić, T.T. Katona: “Tečni kristali i primena“, Univerzitet u Novom Sadu, Edicija “Univerzitetska naučna knjiga ”, PMF, MP Stilos, (1999) (144 str.).
2. J.W. Goodby *et al*., Ferroelectric liquid crystals: principles, properties and applications, Gordon and Breach Science Publishes (1991).
3. С. А. Пикин: “Структурни прелази у течним кристалима “, Москва «Наука» (1981).
4. G. W. Gray, P. A.Winsor: “Liquid Crystal and Plastic Crystals”, Vol.1,2, John Wiley and Sons Limited (1974).

5. P. G. de Gennes: “The Physics of Liquid Crystals”, Clarendon Press, Oxford (1974).
6. D. Demus at all: “Textures of Liquid Crystals”, VEB Deutscher Verlag für Grundstoffindustrie, Leipzig (1978).
7. Peer reviewed international journal and articles on the topic of ferroelectric liquid crystal

Weekly teaching load				Other:
Lectures: 4	Exercises:	Other forms of teaching:	Student research: 6	