

Oxide materials for optoelectronics

Invited lecturers: J. Paul Attfield, Sergey Medvedev, C. Richard A. Catlow, Alfonso Munoz, Nirupam Chakraborti, Miroslav Dramicanin, Chong-Geng Ma

SPRING SEMESTER 2023, Auditorium, Institute of Physics PAS

ORGANIZERS: Prof. Wojciech Paszkowicz (Institute of Physics PAS), Prof. Andrzej Suchocki (Institute of Physics PAS), Dr. Roman Minikayev (Institute of Physics PAS)

The series of lectures entitled "**Oxide materials for optoelectronics**" is devoted to studies of oxide materials. The lectures will include the synthesis and properties of oxides, as well as experimental and theoretical methods of study useful in the science of oxides. In particular, the lectures will cover synthesis under pressure, variation of optical properties with pressure, modeling of the crystal structure, defects, and electronic structure. Lectures will be given also on evolutionary optimization and on modeling methods, on optical thermometry as well as on the modeling of phosphors. The program is intended for both scientists entering the subject of oxides and for PhD students. Some of the lectures cover experimental and theoretical methods with general application (not only in the field of oxides). Interested listeners will be highly encouraged to participate in discussions after the lectures and to contact lecturers directly.

Cykl wykładów zatytułowany "Materiały tlenkowe dla optoelektroniki" poświęcony jest badaniom materiałów tlenkowych. Wykłady obejmują syntezę i właściwości tlenków oraz eksperymentalne i teoretyczne metody badań przydatne w nauce o tlenkach. W szczególności wykłady będą dotyczyły syntezy pod ciśnieniem, zmian właściwości optycznych pod wpływem ciśnienia, modelowania struktury kryształu i defektów oraz struktury elektronowej. Przedstawione zostaną wykłady z optymalizacji metodami ewolucyjnymi i z metod modelowania, termometrii optycznej oraz modelowania luminoforów. Program wykładów przeznaczony jest zarówno dla naukowców rozpoczynających tematykę tlenków, jak i dla doktorantów. Część wykładów dotyczy eksperymentalnych i teoretycznych metod ogólnego (nie tylko dla materiałów tlenkowych) zastosowania. Zainteresowanych słuchaczy zachęcamy do udziału w dyskusjach po wykładach oraz do bezpośredniego kontaktu z wykładowcami.

Schedule

| <i>N</i> <i>O</i> | <i>date</i> | <i>lecturer</i> | <i>lecture titles</i> |
|----------------------|---|--|--|
| 1.1 | Mon 8 May 2023, 10:30-11:15 +discussion | Prof. J. Paul Attfield <i>University of Edinburgh (UK)</i> | High pressure synthesis of new oxides and nitrides. Overview of extreme conditions science and HP synthesis methods (LVP etc.) |
| 1.2 | Wed 10 May 2023, 13:30-14:15 +discussion | Prof. J. Paul Attfield | High pressure synthesis of new oxides and nitrides. Examples of new high-pressure electronic and magnetic materials |
| 1.3 | Thu 11 May 2023, 13:00-13:45 +discussion | Prof. J. Paul Attfield | High pressure synthesis of new oxides and nitrides. Examples of new high-pressure electronic and magnetic materials (suite) |
| 2.1 | Mon 15 May 2023, 10:30-11:15 +discussion | Dr. Sergey Medvedev Max-Planck-Institut für Chemische Physik fester Stoffe, Dresden (Germany) | What can we learn from high-pressure studies (part 1) (deferred to a later date TBA) |

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| 2.2 | Wed 17 May 2023, 13:00-13:45 +discussion | Dr. Sergey Medvedev | What can we learn from high-pressure studies (part 2) (deferred to a later date TBA) |
| 2.3 | Fri 19 May 2023, 12:00-12:45 +discussion | Dr. Sergey Medvedev | What can we learn from high-pressure studies (part 3) (deferred to a later date TBA) |
| 4.1 | Mon 22 May 2023, 10:30-11:15 +discussion | Prof. Alfonso Muñoz <i>La Laguna University (Spain)</i> | <i>Ab-initio</i> simulations in high pressure condensed matter, fundamentals and applications (part 1) |
| 4.2 | Wed 24 May 2023, 12:00-12:45 +discussion | Prof. Alfonso Muñoz | <i>Ab-initio</i> simulations in high pressure condensed matter, fundamentals and applications (part 2) |
| 4.3 | Fri 26 May 2023, 12:00-12:45 +discussion | Prof. Alfonso Muñoz | <i>Ab-initio</i> simulations in high pressure condensed matter, fundamentals and applications (part 3) |
| 3.1 | Wed 31 May 2023, 12:00-12:45 +discussion | Prof. C. Richard A. Catlow <i>University College London (UK) – online</i> | Modelling of bulk and surface structures of oxides |
| 3.2 | Thu 1 June 2023, 12:00-12:45 +discussion | Prof. C. Richard A. Catlow <i>– online</i> | Modelling of electronic properties of oxides |
| 6.1 | Mon 12 June 2023, 10:30-11:15 +discussion | Prof. Miroslav Dramicanin <i>Vinca Institute of Nuclear Sciences (Serbia)</i> | Optical thermometry with lanthanide and transition metal activated oxide materials (part 1) |
| 3.3 | Mon 12 June 2023, 12:00-12:45 +discussion | Prof. C. Richard A. Catlow <i>– online</i> | Modelling of defect properties of oxides |
| 5.1 | Tue 12 June 2023, 14:00-14:45 +discussion | Prof. Nirupam Chakraborti <i>Czech Technical University in Prague (Czechia)</i> | Evolutionary optimization / modeling methods and their applications in materials (including oxides) design (part 1) |
| 6.2 | Tue 13 June 2023, 12:00-12:45 +discussion | Prof. Miroslav Dramicanin | Optical thermometry with lanthanide and transition metal activated oxide materials (part 2) |
| 5.2 | Tue 13 June 2023, 13:00-13:45 +discussion | Prof. Nirupam Chakraborti | Evolutionary optimization / modeling methods and their applications in materials (including oxides) design (part 2) |
| 6.3 | Wed 14 June 2023, 12:00-12:45 +discussion | Prof. Miroslav Dramicanin | Optical thermometry with lanthanide and transition metal activated oxide materials (part 3) |
| 5.3 | Wed 14 June 2023, 13:00-13:45 +discussion | Prof. Nirupam Chakraborti | Evolutionary optimization / modeling methods and their applications in materials (including oxides) design (part 3) |
| 7.1 | Fri 16 June 2023, 12:00-12:45 +discussion | Prof. Chong-Geng Ma <i>Chongqing University of Posts and Telecommunications (China)</i> | How to make "good" phosphors via first-principles modelling (part 1) (deferred to a later date TBA) |
| 7.2 | Mon 19 June 2023, 10:30-11:15 +discussion | Prof. Chong-Geng Ma | How to make "good" phosphors via first-principles modelling (part 2) (deferred to a later date TBA) |
| 7.3 | Wed 21 June 2023, 12:00-12:45 +discussion | Prof. Chong-Geng Ma | How to make "good" phosphors via first-principles modelling (part 3) (deferred to a later date TBA) |