

Course KJM-MENA 5130/9130 spring 2020, by Pavel Karen

Nonstoichiometry and phase relations of inorganic solids

Tuesdays 10:15–12:00 in seminar room Curie and Fridays 10:15–12 in Ø186

#		<i>Content</i>	<i>Pensum</i> <i>Compendium of 4 parts</i>
1	21.01.2020 24.01.2020	Symmetry of periodic structures expressed in space group symbols. Description of a crystal structure	Structures of crystalline materials (pp. 58)
2	28.01.2020 31.01.2020	Build-up of structures: Packing, networks, metal-organic frameworks	Structures of crystalline materials
3	04.02.2020 07.02.2020	Examples: Spinel, garnet, pyrochlore, perovskite. Group–subgroup relationships	Structures of crystalline materials
4	11.02.2020 14.03.2020	Compositional variations due to defects: Point defects in elements and compounds, formation thermodynamics. Solid solutions.	Defects, extended defects and ordered vacancy structures
5	18.02.2020 21.02.2020	Extended defects: 1D (edge and screw dislocations), 2D (stacking faults, twinning, antiphase boundaries, and crystallographic shear structures)	Defects, extended defects and ordered vacancy structures (pp. 44)
6	25.02.2020 28.02.2020	Nonstoichiometry due to 3D order: Defect ordering and clustering. Long-range order of vacancies. Infinitely adaptive structures	Defects, extended defects and ordered vacancy structures
7	03.03.2020 06.03.2020	Nonstoichiometry and modulated structures: Commensurate and incommensurate	Defects, extended defects and ordered vacancy structures
8	10.03.2020 13.03.2020	Narrow nonstoichiometry: Oxidative and reductive non-stoichiometry in a binary oxide, effects of doping. Wide nonstoichiometry.	Nonstoichiometry and its transport (pp. 53)
9	17.03.2020 20.03.2020	Nonstoichiometry transport I: Fick laws. Atomistics of self-diffusion (probability of hopping) and steady-state diffusion (hopping in concentration gradient, electric field, conductivity versus diffusivity)	Nonstoichiometry and its transport
10	24.03.2020 27.03.2020	Nonstoichiometry transport II: Ambipolar diffusion. Nonsteady-state diffusion. Sintering.	Nonstoichiometry and its transport
11	31.03.2020 03.04.2020	Multi-component phase diagrams with compound formation, solid solutions and nonstoichiometry	Phase diagrams and phase transitions (pp. 45)
12	14.04.2020 17.04.2020	Structural phase transitions I: Classification, examples, symmetry, thermodynamics.	Phase diagrams and phase transitions

13	21.04.2020 24.04.2020	Structural phase transitions II: Order–disorder transitions and order parameters.	Phase diagrams and phase transitions
14	28.04.2020 30.04.2020*	Structural phase transitions III: Landau theory for 1 st and 2 nd order displacive transitions, soft modes.	Phase diagrams and phase transitions

* The change will have to be agreed upon.

Oral exam is May 7 and 8, 2020. You can cancel your exam registration with no reason up to April 24 at the Study Administration in the Department of Chemistry (Lieu). The place and hours are to be agreed upon. Grades A to E for Master students and “passed(≡A,B)/not-passed(≡C-E)” for doctor-grade students. Upon passing, 10 ECTS study points are credited.