**X-ray Powder Diffraction**

Žlutě podbarvená pole jsou položky, podle kterých bude možno v této databázi vyhledávat

**Equipment: X-ray Powder Diffraction**

**No. of Equipment: UPOL7**

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**Equipment Description**

**Description of equipment:**

X-ray powder diffraction is fast nondestructive physical method commonly used for structural and phase analysis of crystalline phases and determination of particle and crystallite size of nanocrystalline materials. X-ray powder diffraction with employed high-temperature/reaction chamber can be utilized for all above mentioned analysis in non-ambient conditions (i.e., elevated temperature and/or gas pressure), and furthermore, for performing in-situ monitored thermally induced solid state reactions and solids-gas reactions.

**Specifications**

### θ-θ Bragg-Brentano parafocusing geometry (2θ range: 0 – 145°)

### Co Kα radiation (λ = 1.79031 Å)

### Reflexion/transmission configuration

### Grazing incidence (GI) regime

### Small Angle X-ray Scattering (SAXS)

### Measurement in various temperatures (25 – 1200 °C)

### Oxidative (1200 °C)/inert (1200 °C)/reductive (900 °C) atmosphere/vacuum

### Variable pressure (1 mbar – 10 bar)

**Acquired information**

### Identification of crystalline phases

### Quantitative phase analysis

* Determination of amorphous phase content

### Structural analysis of powder samples

### Determination of particle size

### Determination of Mean X-ray Coherence Length (MCL)

### Determination of residual stress in (nano)material samples

### Monitoring and determination of structural/phase transformations in non-ambient conditions

### Determination of temperature dependent dilatation

**Sample types**

### Powder (nano)materials

### Bulk nanostructured materials (maximal sample size: diameter 140 mm, height 64 mm, weight 2 kg)

### Thin films

### Liquid samples (measured in capillary)

### Above mentioned types of samples unstable in the air (measured in protective Kapton foil)

**Specification of expertise relevant to NanoEnviCz workpackages:**

**WP3**a,c-h **WP4**a,b,c **WP5**a**,**c, **WP6**a,d-f, **WP7**a-d,f,h,i

**Detailed description of expertise**

**Please, specify the main research topics connected with equipment**:

Room temperature structural and phase characterization of nanostructured materials

### Identification of crystalline phases

### Quantitative phase analysis

* Determination of amorphous phase content

### Structural analysis of powder samples

### Determination of particle size

### Determination of Mean X-ray Coherence Length (MCL)

### Determination of residual stress in (nano)material samples

**Please, specify the secondary research topics connected with equipment:**

Synthesis and in-situ monitored structural transformations of the (nano)materials

### Synthesis of zero-valent iron (nano)microparticles for water treatment technologies

### Synthesis of iron based composite materials for water treatment technologies

### Thermally induced solid state and solid state-gas redox and/or polymorphous transformation of inorganic materials

**Keywords describing research area:**

X-ray powder diffraction, phase analysis, structure, crystallinity, particle size, solid state transformations

**Competence**

**Relevance for applied and industrial research:**

Structural and phase characterization of (nano)structured materials

Optimization of synthesis conditions for iron based materials for water treatment technologies

**Relevance for fundamental studies:**

Studying of thermally induced solid state and solid state-gas reactions

Structural refinement of nanocrystalline materials