

# In-situ experiments by Nuclear Forward Scattering

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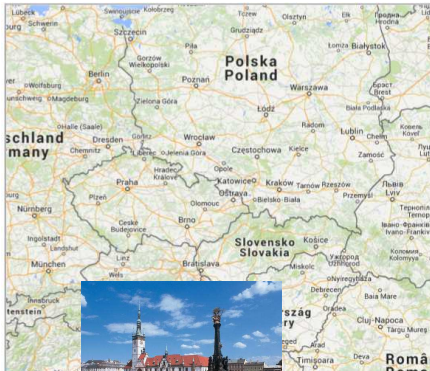
# Outline

- 1 Introduction
- 2 In-situ observation of chemical reactions
- 3 In-situ crystallization of amorphous metals
- 4 Data analysis

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- Palacky University in Olomouc, Czech Republic (Vrba, Procházka)
- Slovak Technical University in Bratislava (Miglierini)



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# High valence (VI) iron decomposition

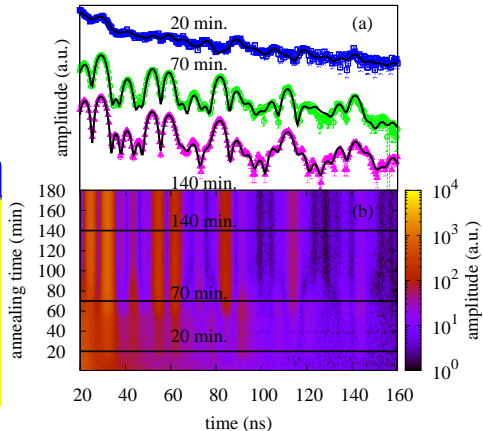
- Cleaning of contaminated water and waste water
- Find mechanism of the decomposition
- Observation of possible intermediate state
- $^{57}\text{Fe}$  to 75% enriched powder of  $\text{K}_2\text{Fe}^{\text{VI}}\text{O}_4$
- sample holder - capillary
- $T = 200\text{ }^\circ\text{C}$ ,  $220\text{ }^\circ\text{C}$ ,  $235\text{ }^\circ\text{C}$  and  $250\text{ }^\circ\text{C}$
- Characteristic time of decomposition is tens of minutes
- Time NFS spectrum accumulation - 1 min.
- P01, DESY, Hamburg

# Results, isothermal decomposition at 235 °C

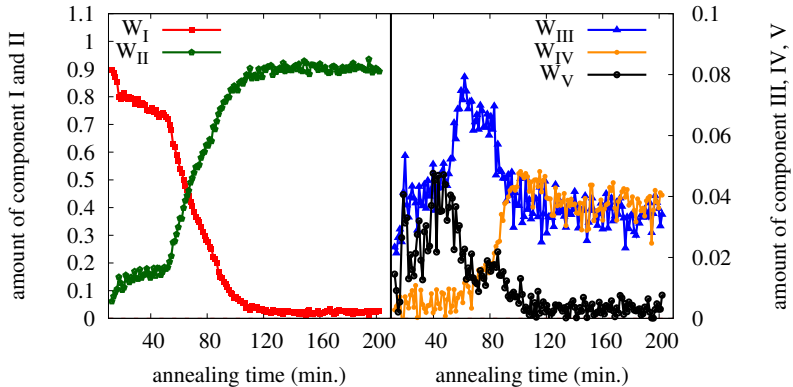
- Precursor paramagnetic
- Product magnetic

## Analysis

- Building physical model (spectral components)
- Fitting of Hyperfine parameters
- CONUSS



# Results, isothermal process, $T = 235^{\circ}\text{C}$



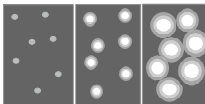


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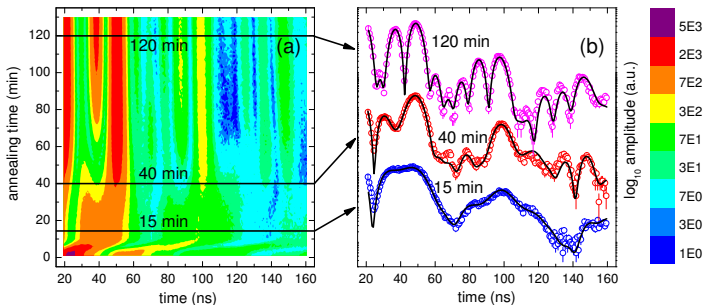
# Amorphous metals crystallization

- Amorphous metals (metallic glasses), composition  $\text{Fe}_{90}\text{Zr}_7\text{B}_3$
- Interesting magnetic properties
- Its properties are determined by microstructural ordering
- Preparation - fast wheel quenching, disorder of melting if frozen
- Increased temperature caused growing of small grains in the amorphous matter



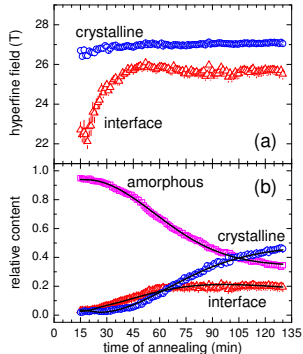
# Crystallization

- ID18, Grenoble
- Isothermal heating
- NFS data were accumulated during 1 min.
- Analysis



# Results of NFS experiments

- Three different areas were identified
- Amorphous, crystal grains and grains interface



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# Sequential fitting procedure

- CONUSS
- In-situ experiments contain around 100 interferograms.
- Neighbors differ only slightly.
- Fitted parameters of N-th interferogram are input values for N+1-th interferogram
- Sequence of fitting is needed
- HUBERT - interface software for CONUSS

# HUBERT - interface software for CONUSS

- Interface software - CONUSS run behind
- Transform data from .fio (Hamburg) and .mca (Grenoble) format to 3column structure
- Run CONUSS,
- Sequential fitting procedure
- Written in QtCreator
- Using "gnuplot" as a plotting tool
- It is FREE and offerd for anyone
- e-mail: v.prochazka@upol.cz,  
willywillow@seznam.cz

# HUBERT - interface software for CONUSS

