Search for and analysis of composition and structure of submicron-size particles in geological samples

Speaker: Darin F.

F.A.Darin@inp.nsk.su
XRF station in SSRC

Monochromator:
Channel-cut Si (111)

Energy resolution:
\[ \delta E/E = 2 - 3 \cdot 10^{-4} \]

Working energy range:
\[ \Delta E = 5 - 40 \text{ keV} \]

Monochromator and slits for beam collimation
Two types of one-dimensional XRF scanners
Confocal X-ray microscope
Sample movement: 25.4 mm XYZ
Minimal step: 0.1 mkm
Beam size: variable from 10 mkm to 100 mkm
Detector: Amptek XR 100 SDD
Monochromator: Channel-cut Si(111)
$\Delta E = 5 - 40$ keV
$\delta E/E = 2 - 3 \cdot 10^{-4}$
Double crystal monochromator

Si (111) : $\Delta E = 5 - 20$ keV
$\delta E/E \sim 1 \cdot 10^{-3}$

Si(311) : $\Delta E = 20 - 40$ keV
$\delta E/E \sim 5 \cdot 10^{-4}$

Single crystal monochromator

Si (111) : $\Delta E = 5 - 40$ keV
$\delta E/E \sim 4 \cdot 10^{-4}$
Where $A=A(E)$ – maximum signal

$w=w(x,y)\equiv\{w_1(x): y<0; \ w_2(x): y\geq0\}$ – distribution width parameter, $x$ - the coordinate of the wire along the incident beam relative to the focus of the lens, $y$ - the transverse coordinate of the wire.

$\text{Sig}(x, y, E) = \frac{A}{w\sqrt{2\pi}} e^{-\frac{y^2}{2w^2}}$

$\text{Sig}(x, y, z, E, E_l) = Be^{-(\frac{x^2}{2v^2} + \frac{y^2}{2w(x=0,y)^2})}$

где $B$ – normalization coefficient,

$v=v(E_l) – x$ distribution width parameter
The study of the Tunguska event

Dated layers (1908 g) of bottom sediments of lakes of the Tunguska were selected to searching traces of meteorite. Particles of iron meteorites (Chelyabinsk meteorite) and iron-stone (Sikhote-Alin meteorite) were studied for identify characteristic features of the composition of meteorites.
Sikhote-Alin meteorite

E=15keV, 24*48 pixels, step 50 mkm, t=30sec
Sikhote-Alin meteorite

E=15keV, 21*22 pixels, step 5mkm, t=60sec
Sikhote-Alin meteorite

![Image of the meteorite sample]

**Diagram: XANES**

- **W-L₂**
  - a) Sample
  - b) Reference foil

**Graph:**
- XANES (отн. ед.)
  - E (eV)
  - 11400 11450 11500 11550 11600 11650

**Legend:**
- a) Sample
- b) Reference foil
Pd investigation in Bushveld samples

Concentration scan interval, mm

Scanning area

Concentration

E. keV

I/I₀, a.u.
Pd-EXAFS

- Pd-O (~2.05 Å)
- Pd-S (~2.30 Å)
- Pd-Pd (2.78 Å)
- Pd-O-Pd (~3.4 Å)
- Pd-S-Pd (~3.3-3.6 Å)

a) Pd – reference foil
b) PdO – reference
c) Sample
Thank you for your attention!