Structural and vibrational properties of the $Cu_3Bi(SeO_3)_2O_2Cl$ francisite at high-pressure

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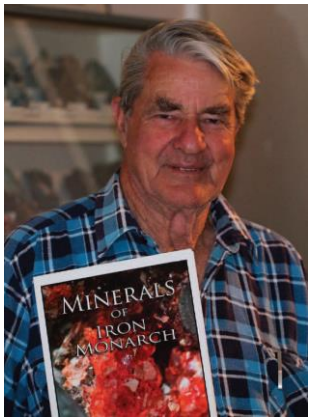
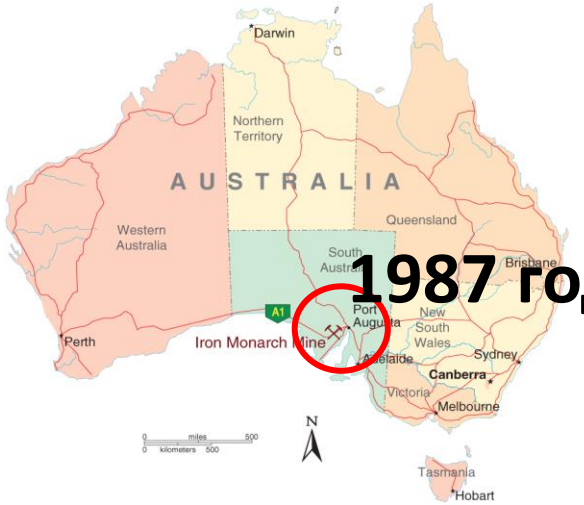
AYSS-2024

Crystal structure of $Cu_3Bi(SeO_3)_2O_2Cl$ compound

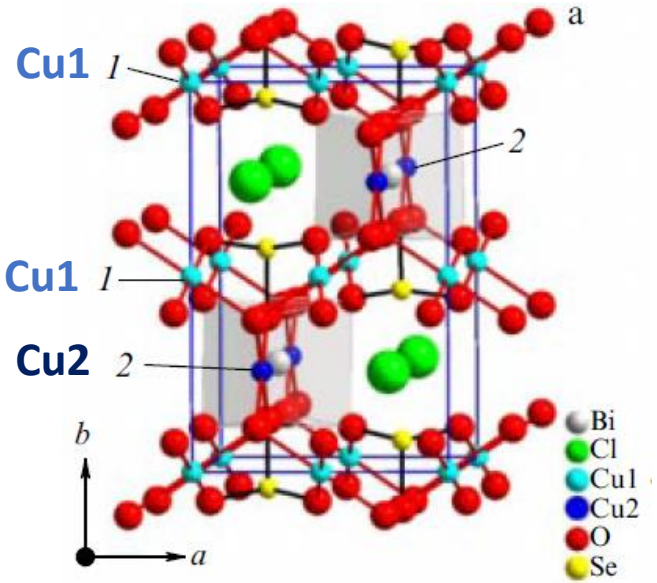


Glyn L. Francis

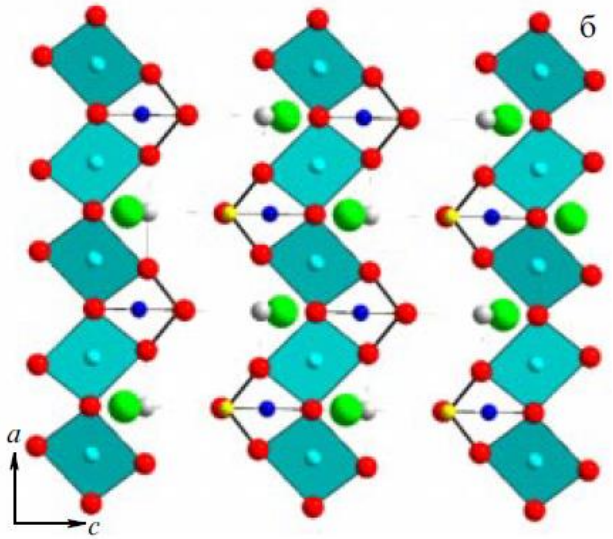


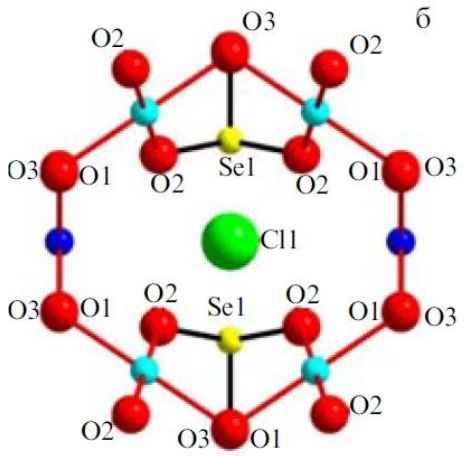
1987 год

$Cu_{3.10}Bi_{1.16}Se_{1.86}O_{8.12}Cl_{0.88}$



The orthorhombic structure *Pmmn*





УФН 2021 Т. 191, № 4

Isostructural compounds based on the Francisite

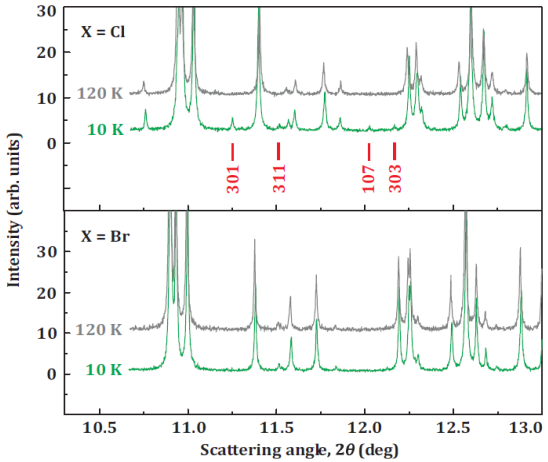
$Cu_3R(Se_{1-x}Te_xO_3)_2O_2X$ compounds

R – rare earth elements, X – Cl, Br, I

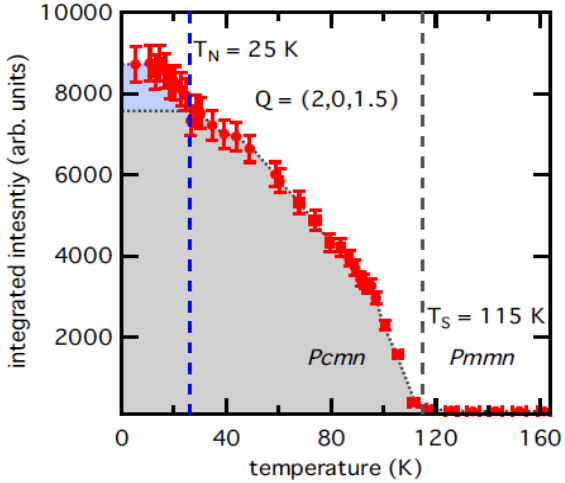
1	$Cu_3Bi(SeO_3)_2O_2Cl$
2	$Cu_3Bi(SeO_3)_2O_2Br$
3	$Cu_3Bi(SeO_3)_2O_2I$
4	$Cu_3Y(SeO_3)_2O_2Cl$
5	$Cu_3La(SeO_3)_2O_2Cl$
6	$Cu_3Nd(SeO_3)_2O_2Cl$
7	$Cu_3Sm(SeO_3)_2O_2Cl$
8	$Cu_3Eu(SeO_3)_2O_2Cl$
9	$Cu_3Gd(SeO_3)_2O_2Cl$
10	$Cu_3Dy(SeO_3)_2O_2Cl$
11	$Cu_3Ho(SeO_3)_2O_2Cl$
12	$Cu_3Er(SeO_3)_2O_2Cl$
13	$Cu_3Yb(SeO_3)_2O_2Cl$
14	$Cu_3Lu(SeO_3)_2O_2Cl$
15	$Cu_3La(SeO_3)_2O_2Br$
16	$Cu_3Nd(SeO_3)_2O_2Br$
17	$Cu_3Sm(SeO_3)_2O_2Br$
18	$Cu_3Gd(SeO_3)_2O_2Br$

1	$Cu_3Bi(TeO_3)_2O_2Cl$
2	$Cu_3Bi(Se_{0,8}Te_{0,2}O_3)_2O_2Cl$
3	$Cu_3Bi(Se_{0,6}Te_{0,4}O_3)_2O_2Cl$
4	$Cu_3Bi(Se_{0,4}Te_{0,6}O_3)_2O_2Cl$
5	$Cu_3Bi(SeO_3)_2O_2Cl_{0,5}Br_{0,5}$

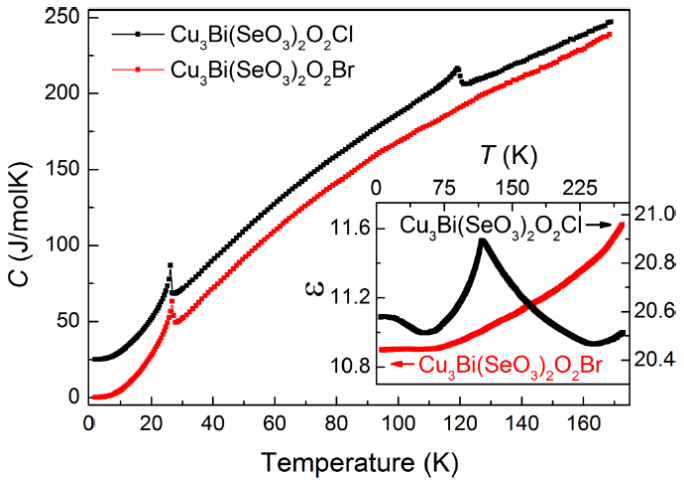
УФН 2021 Т. 191, № 4



PHYSICAL REVIEW B **95**, 064102 (2017)



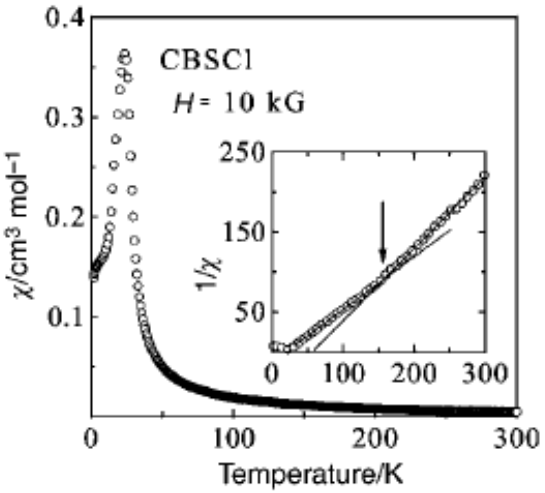
PHYSICAL REVIEW B **96**, 014413 (2017)



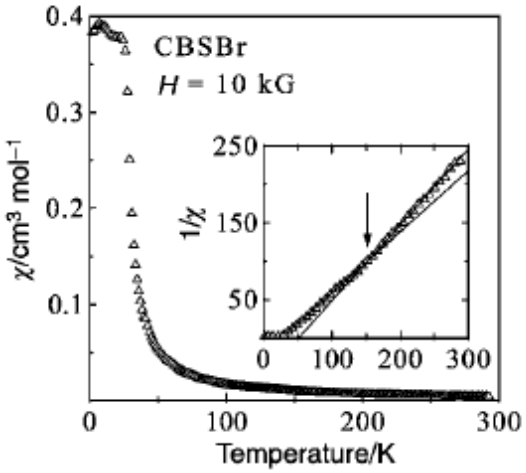
PHYSICAL REVIEW B **96**, 115144 (2017)

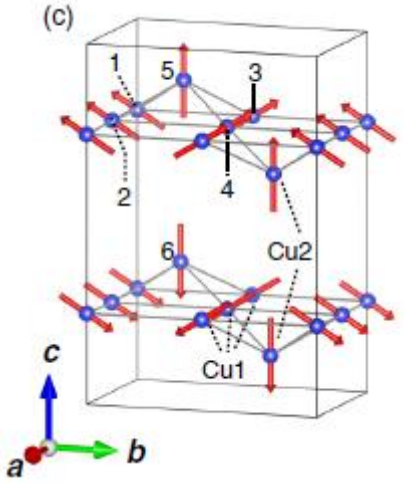
Magnetic properties of $Cu_3R(Se_{1-x}Te_xO_3)_2O_2X$ compounds

$Cu_3Bi(SeO_3)_2O_2Cl$



$Cu_3Bi(SeO_3)_2O_2Br$

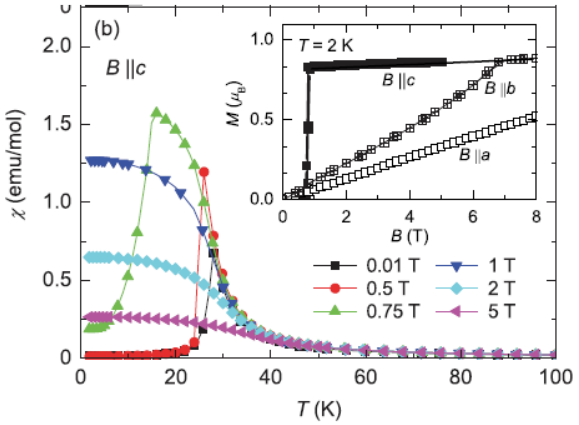




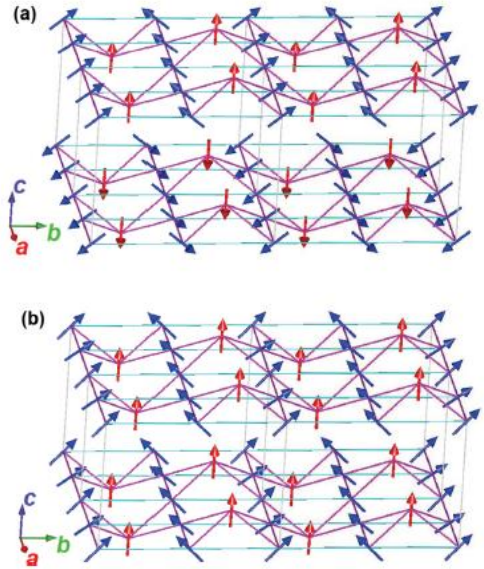
J. Mater. Chem., 2001, **11**, 1152–1157

PHYSICAL REVIEW B **96**, 014413 (2017)

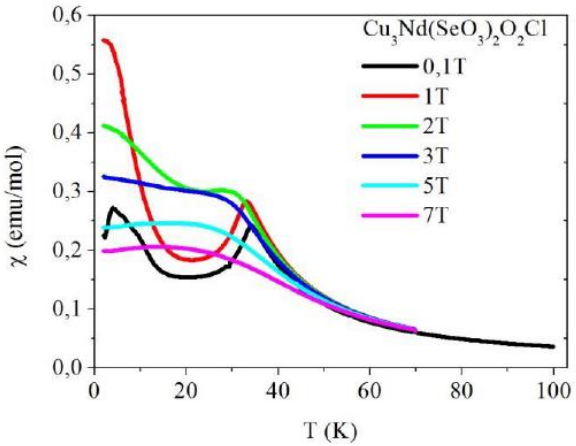
$Cu_3Bi(SeO_3)_2O_2Br$



PHYSICAL REVIEW B **86**, 144409 (2012)

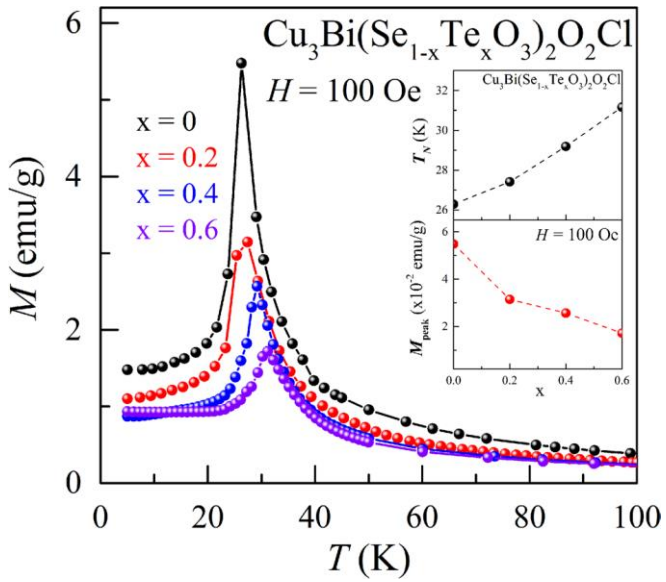


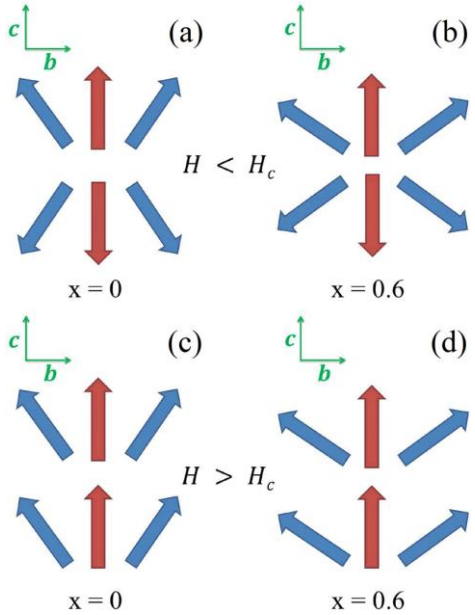
$Cu_3Nd(SeO_3)_2O_2Cl$

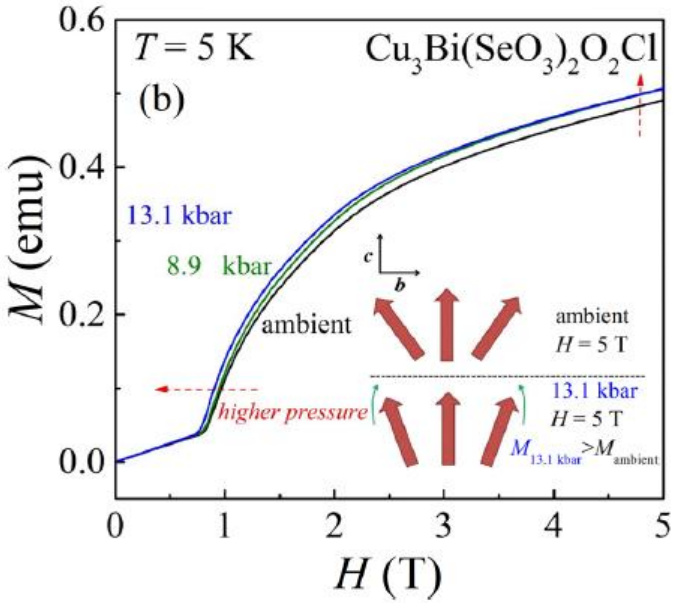


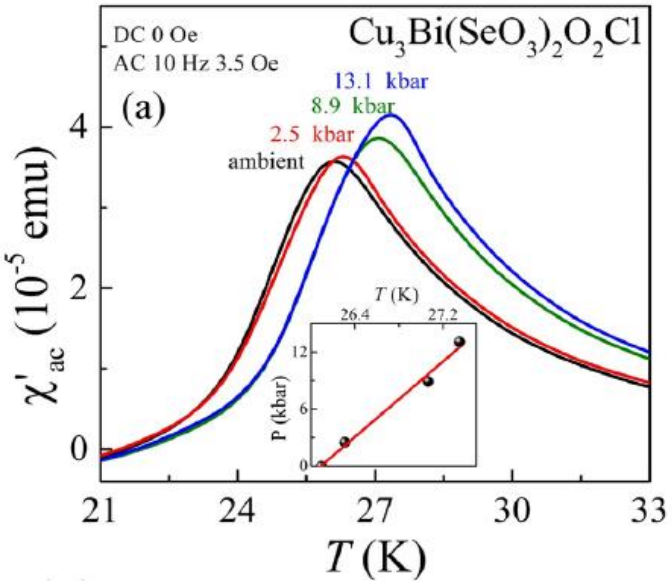
Markina M M et al. *J. Magn. Magn. Mater.* **492** 165721 (2019)

$Cu_3Bi(Se_{1-x}Te_xO_3)_2O_2Cl$ compounds under high pressure



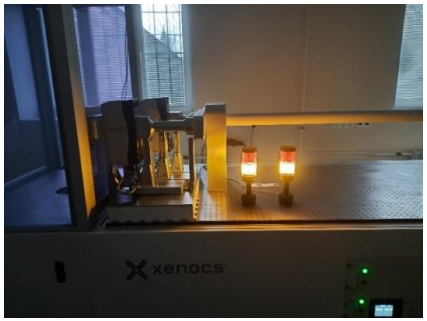




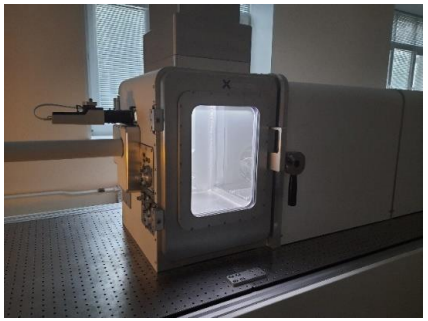


J. Phys. D: Appl. Phys. **50** (2017) 265002

X – ray diffractometers Xeuss , FLNP JINR (Dubna, Russia)



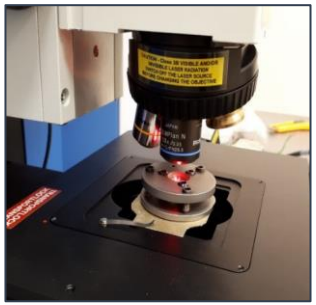
Maximum pressure ~ 35 GPa

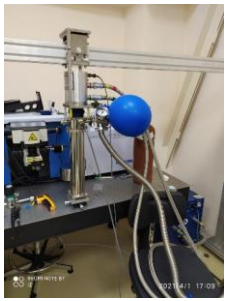


Temperature is 300 K

LabRAM spectrometer Horiba, FLNP JINR (Dubna, Russia)

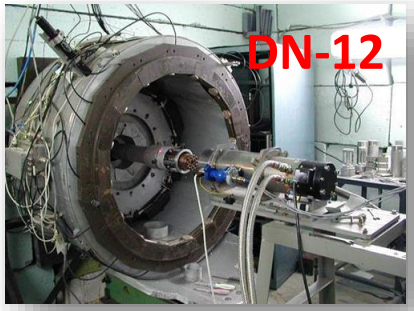
Maximum pressure ~ 35 GPa





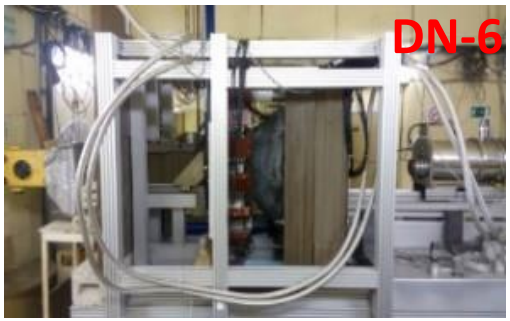
Temperature range: 15 -300 K

Neutron diffractometers at IBR-2 reactor: DN-12 и DN-6

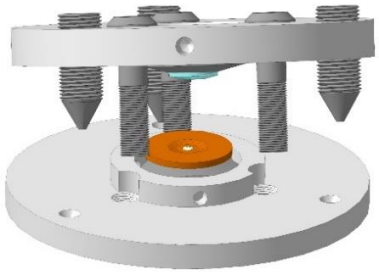


Maximum pressure ~ 8 GPa =80 000 atm.

Temperature range: 10 -320 K

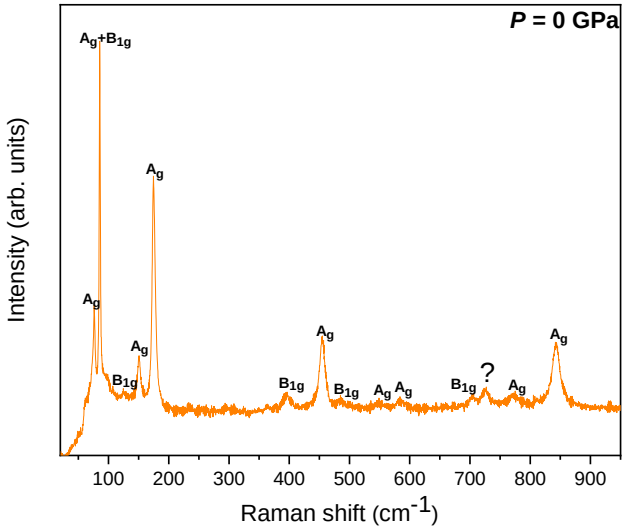


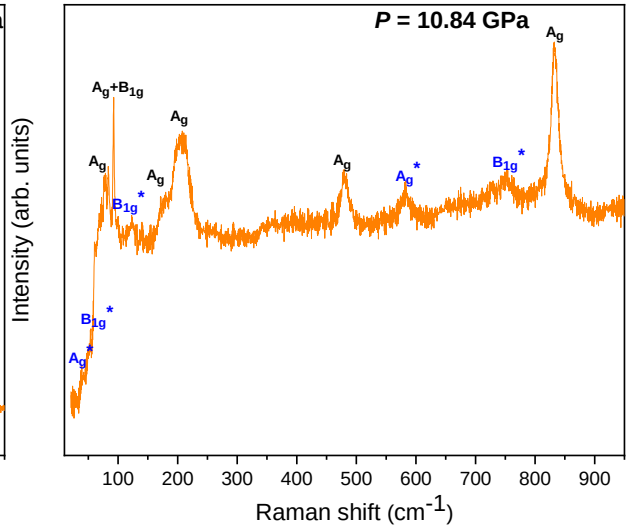
Maximum pressure ~ 35 GPa

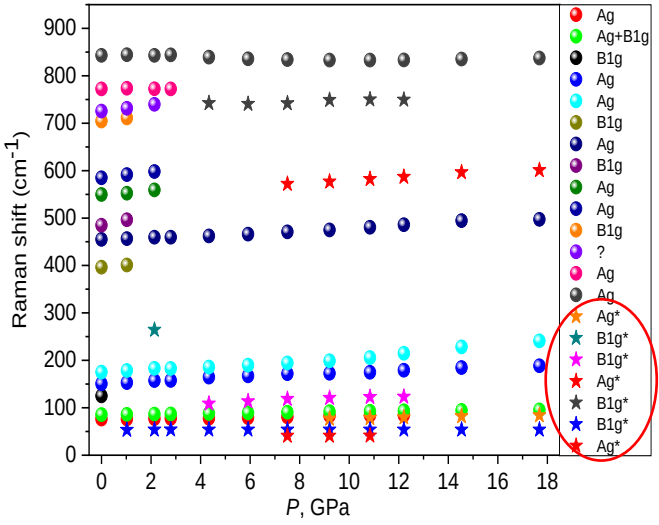


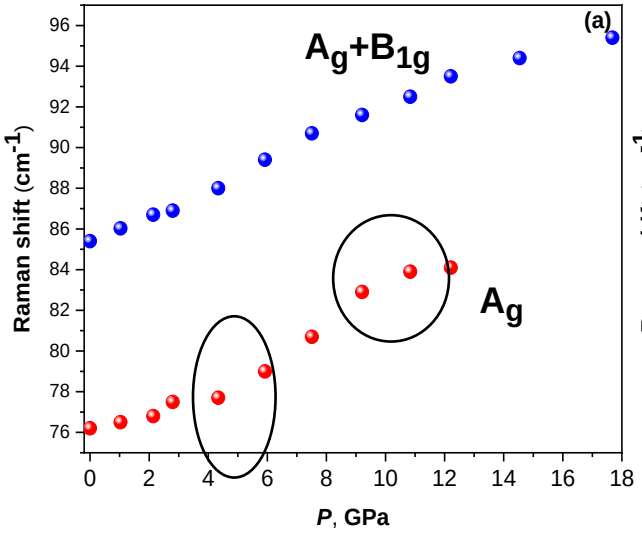
Temperature range: 4 -320 K

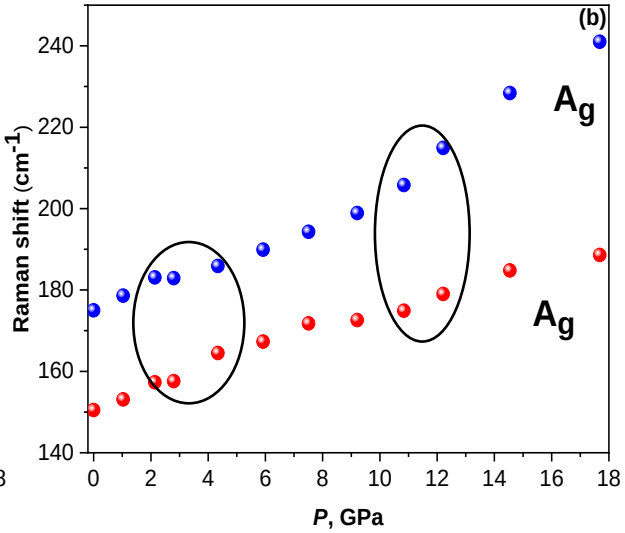
Raman spectroscopy of $Cu_3Bi(SeO_3)_2O_2Cl$ under high pressure

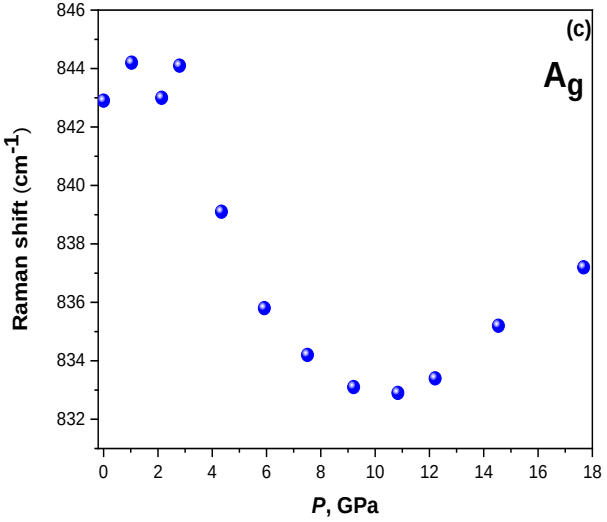




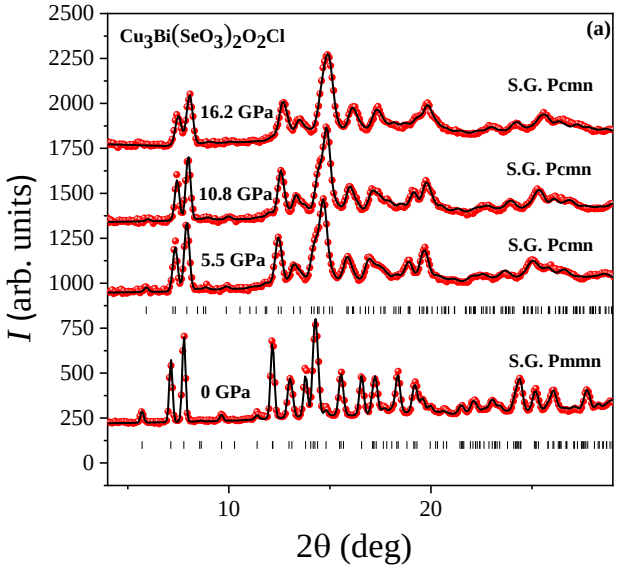


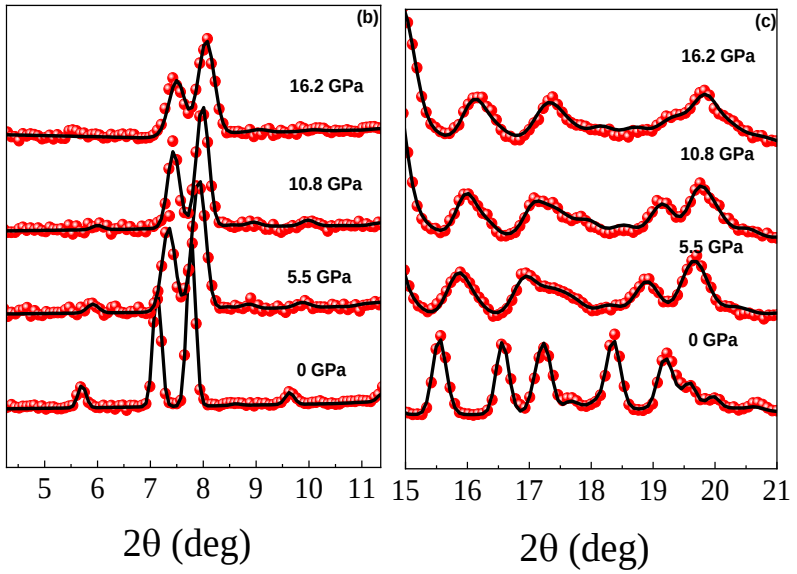


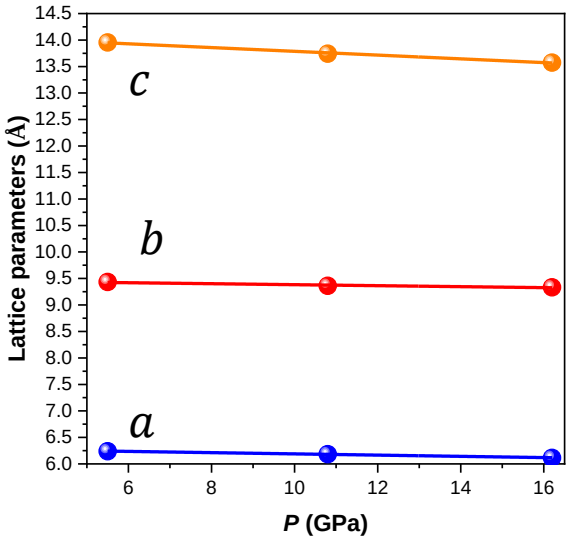


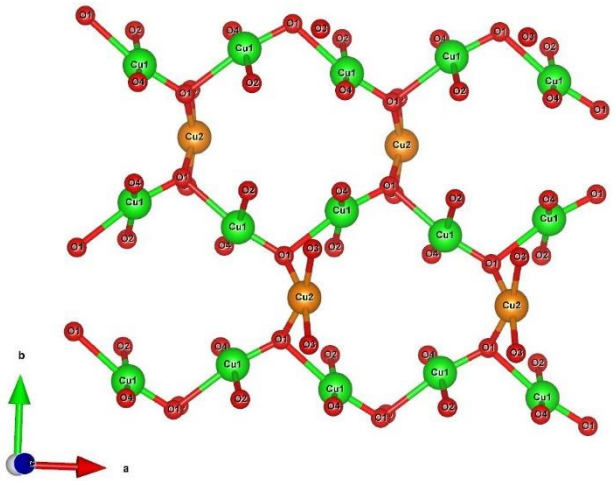


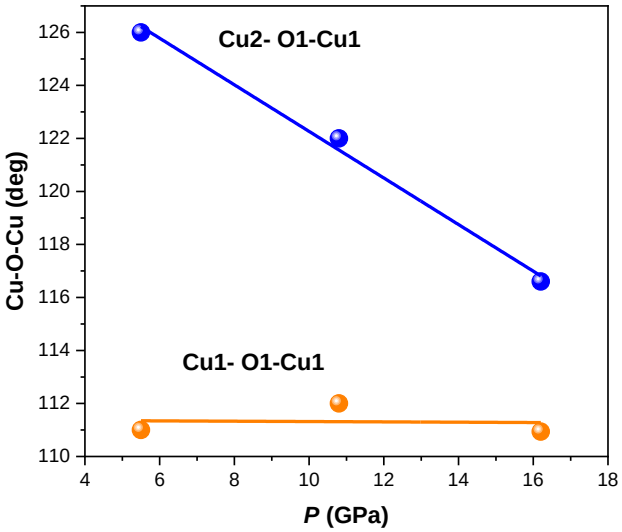
Crystal structure of $Cu_3Bi(SeO_3)_2O_2Cl$ under high pressure











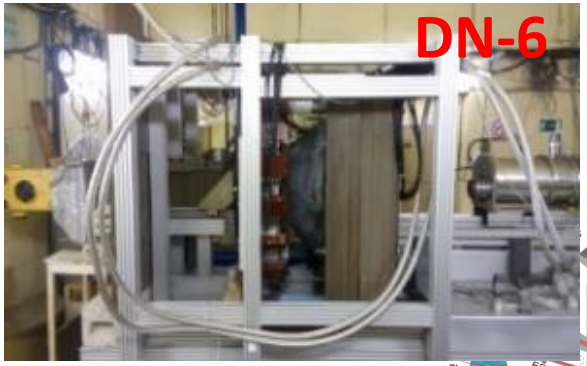
$k_a = 1.9(1)\times10^{-3}$ ГПа$^{-1}$

$k_b = 1.0(2)\times10^{-3}$ ГПа$^{-1}$

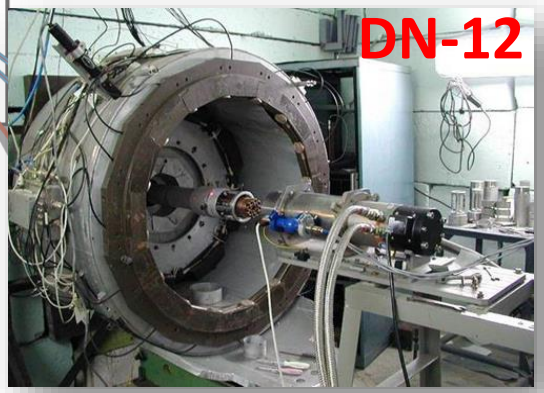
$k_c = 2.0(2)\times10^{-3}$ ГПа$^{-1}$

Conclusion

Plans for the future:



Neutron diffraction experiments under high pressure up to 30 GPa and at low temperature up to 5 K



Neutron diffraction experiments in the magnetic field up to 3 T under high pressure up to 5 Gpa and at low temperature up to 10 K

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doi:10.1088/1742-6596/1021/1/012048

Development of the sample environment system for the DN-12 diffractometer on the IBR-2M pulsed reactor (pressure – temperature – magnetic field). Project status.

A Chernikov[1], I Dobrin[2], N Kovalenko[1], S Kulikov[1], O Culicov[1,2] , I Popovici[2], D Enache[2] and A Dobrin[2]

Thank you for your attention!