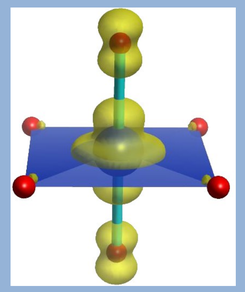
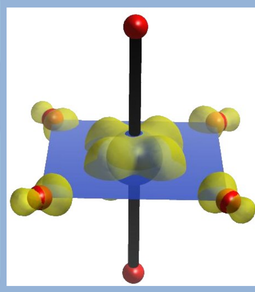


CHEMISTRY OF DIVALENT SILVER: A CORNUCOPIA OF PECULIARITIES



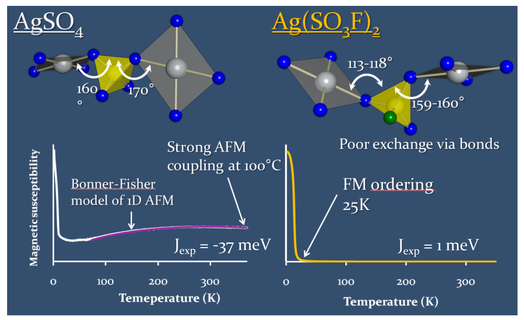
The main goal of the TEAM project *Quest for superconductivity in crystal-engineered higher fluorides of silver* was the synthesis and characterization of **the first non-oxocuprate high-temperature superconducting material based on derivatives of divalent silver, Ag(II)**.

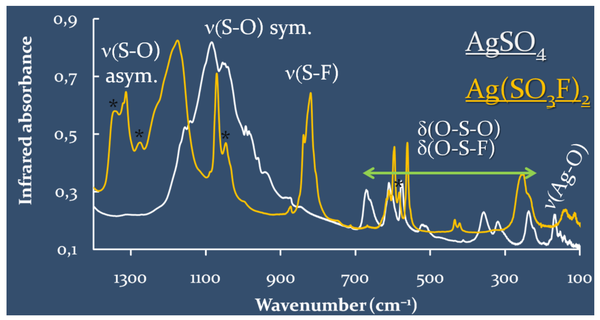
The 4-year project brought together 14 scientists and resulted in: 1 habilitation , 2 Ph. D. theses , 8 M. Sc. theses and 23 publications (total IF = 88.1)

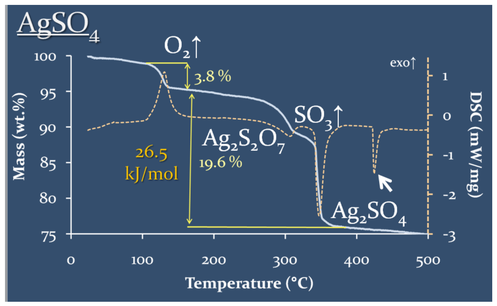
Presenting person: Dominik Kurzydłowski, Ph. D.

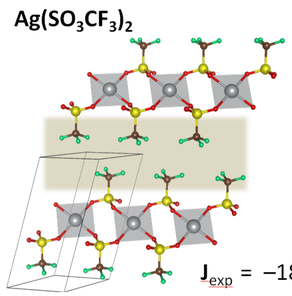
Oxygen bearing systems

Extension of Ag(II) chemistry towards the SO_4^{2-}, SO_3F^- and $SO_3CF_3^-$ derivatives

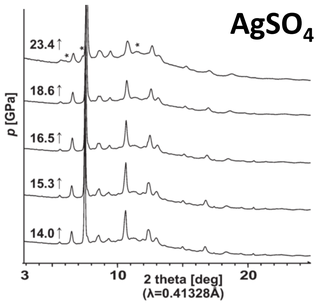








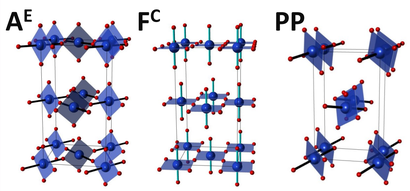
J_{exp} = −18 meV

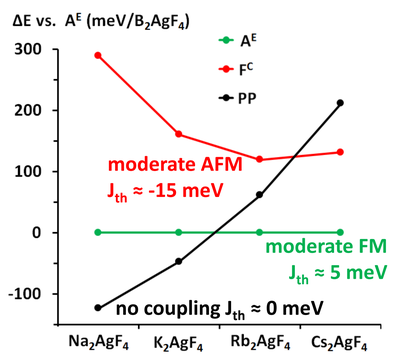


P. J. Malinowski *et al.*, *Angew. Chem.*, 2010, **49**, 1683 | P. J. Malinowski *et al.*, *Chem. Eur. J.*, 2011, **17**, 10524

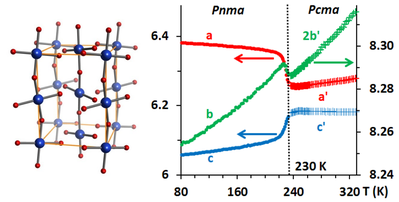
Fluoride systems

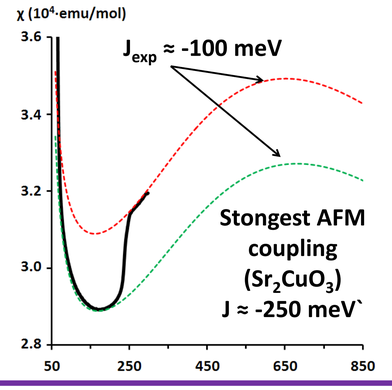
Control of structural and 2D magnetic properties in M_2AgF_4



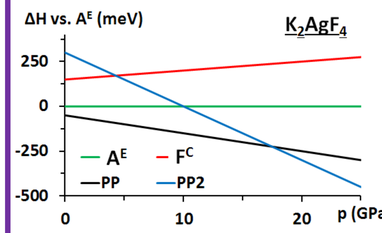


Unusually strong 1D AFM coupling exhibited by $KAgF_3$

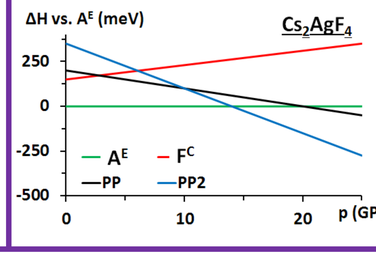




High-pressure polymorphism

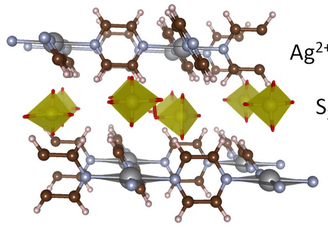


New high-pressure phase - PP2 (strong 1D AFM J_{th} ≈ -80 meV)



P. J. Malinowski *et al.*, *Chem. Commun.* , 2013, **49**, 6262 | W. Grochala, *J. Mater. Chem.*, 2009, **19**, 6949.

Nitrogen bearing systems

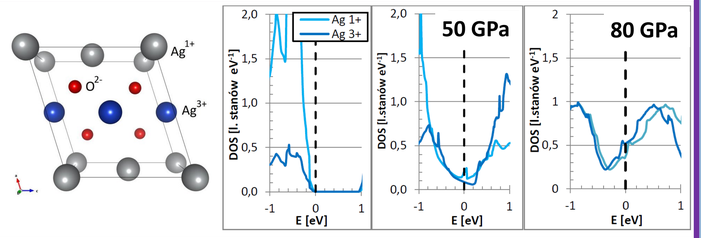


Ag^{2+}(pyrazine)

S_2O_8

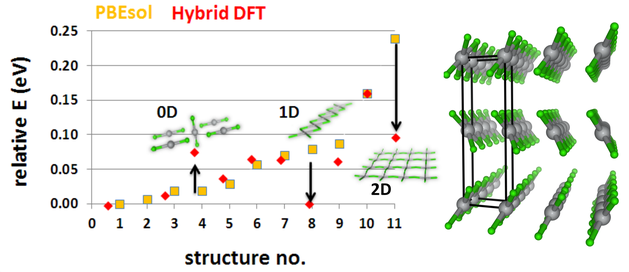
J_{exp} = -4.6 meV

AgO



P. J. Leszczyński *et al.*, *Dalt. Trans.*, 2012, **41**, 396 | I. Włodarska, M.Sc. Thesis., 2014

$AgCl_2$



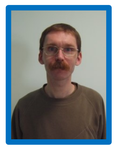
Conclusions

- Wide range of exotic Ag(II) compounds studied
- Structure-magnetism relationship rationalized
- Unusually strong magnetic coupling in $KAgF_3$
- First sulfate salt of Ag(II) (metastable)
- Uncommon decomposition routes for oxo-salts
- ***En route* to the first Ag(II) superconductor**

Project leader

W. Grochala

Senior scientists

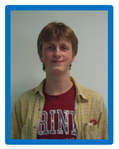


P. Leszczyński

M. Derzsi

A. Budzianowski

Ph.D. students



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J. Seweryn

K. Dymkowski

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P. Kondratiuk

J. Stasiewicz

T. Gilewski

J. Gawraczyński