

Canadian Institute for Neutron Scattering

Institut Canadien de la Diffusion des Neutrons

RESEARCH PROPOSAL

Discuss any proposed experimental work with a local contact before submitting this form. For a list of local contacts, and guidance on completing this research proposal, please see <http://neutron.nrc.gc.ca/beamtime.html>

Send to: Dr. J.H. Root John.Root@nrc.gc.ca
 National Research Council of Canada
 Steacie Institute for Molecular Sciences
 Neutron Program for Materials Research
 Chalk River Laboratories
 Building 459, Station 18
 Chalk River, ON K0J 1J0
 FAX # (613) 584-4040

REVIEW COMMITTEE:

(to be filled in by NRC)

- Materials Science and Engineering
- Soft Materials
- Thin Films and Surfaces
- Condensed-matter Structures
- Quantum Materials

EXPERIMENT TITLE:

Structural investigations of chromium (III) dimetal
 trivanadate (V) $M_2CrV_3O_{11}$, M = Zn, Mg

PROPOSAL NUMBER:

(to be filled in by NRC)

DATE RECEIVED:

(to be filled in by NRC)

PROPOSERS (list principal investigator first):

Research is Proprietary Yes / No

NAME	COMPLETE MAILING ADDRESS	E-MAIL TELEPHONE FAX	NATIONALITY
Wojciech Paszkowicz	Institute of Physics, P.A.S., Al. Lotnikow 32/46, 02-668 Warsaw, Poland	paszk@ifpan.edu.pl	Polish
Sławomir M. Kaczmarek	Institute of Physics, Szczecin University of Technology, Al. Piastów 48, 70-310 Szczecin, Poland	skaczmarek@ps.pl	Polish
Adam Worsztynowicz	Institute of Physics, Szczecin University of Technology, Al. Piastów 48, 70-310 Szczecin, Poland	adam.worsztynowicz@ps.pl	Polish
Monika Bosacka	Department of Inorganic and Analytical Chemistry, Al. Piastow 42, 71-065 Szczecin, Poland	bossm@ps.pl	Polish

Indicate by * which scientist(s) will be present for the experiment.

Proposers will be automatically added to the membership of the Canadian Institute for Neutron Scattering (www.cins.ca). Please indicate if you DO NOT want to become a member.

Complete as fully as possible. Enquiries should be directed to J.H. Root or local contacts as appropriate.

LOCAL NRC CONTACT: Steacie Institute for Molecular Sciences, Neutron Program for Materials Research, Chalk River Laboratories, Building 459, Station 18, Chalk River, ON K0J 1J0, FAX # (613) 584-4040	DESIRED DATES: April-June 2007
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INSTRUMENT PREFERRED: neutron diffractometer	ESTIMATED MEASURING TIME: 3 days	IMPOSSIBLE DATES:
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DESCRIPTION OF SAMPLE:

NAME AND FORMULA:	chromium (III) dimetal trivanadate (V), $M_2CrV_3O_{11}$, M = Zn, Mg		
NUMBER OF SAMPLES:	3	VOLUME:	powders
SAMPLE IS:	liquid / amorphous / <u>powder</u> / single crystal / thin film / other (specify)	WEIGHT:	10 g
		DIMENSIONS:	3*5*0.5 cm

SAMPLE ENVIRONMENT:

SAMPLE MOUNT/CONTAINER TO BE SUPPLIED BY NRC? Yes / No (Preferred containers are of aluminum or vanadium)

SPECIMEN ENVIRONMENT	SPECIMEN ORIENTATION	SPECTROMETER ACCESSORIES
<input type="checkbox"/> Closed Cycle	<input checked="" type="checkbox"/> no	<input type="checkbox"/> Multidetector
<input type="checkbox"/> Cryostat	<input type="checkbox"/>	<input type="checkbox"/> Neutron Velocity Selector
<input type="checkbox"/> Furnace	<input type="checkbox"/>	<input type="checkbox"/> Polarized Beam
<input type="checkbox"/> Water Bath	<input type="checkbox"/>	<input type="checkbox"/> Reflectometry
<input type="checkbox"/> Horizontal field	<input type="checkbox"/>	<input type="checkbox"/> Stress Rig
<input type="checkbox"/> Vertical field	<input type="checkbox"/>	

TEMPERATURE RANGE: Room temperature (~300 K)

MAGNETIC FIELD STRENGTH:

ENVIRONMENT SUPPLIED BY USER: (more details may be requested)

SPECIAL REQUIREMENTS: (cryogrinding, pressure cell, etc.)

SAFETY ASPECTS: Is the sample

radioactive bioactive toxic flammable explosive corrosive

If any box is checked please supply Materials Safety Data Sheet.

Is there any danger associated with the proposed sample? Is there any danger if the sample environment fails e.g. large temperature excursion?

No

IF YES OR UNCERTAIN, GIVE DETAILS.

RANGE IN ENERGY OR WAVELENGTH: wavelength in the range 0.5 - 1 A

COMMENTS OR SPECIAL REQUESTS:

List publications within the last 3 years arising from neutron scattering experiments performed at Chalk River. (Full reference details). Journal, Volume (Year), Pages. List Conference Proceedings and Thesis Titles also.

DESCRIPTION OF PROPOSED RESEARCH

Why is neutron scattering needed as a component of the project? What phenomenon will be studied by neutron scattering? State the type of measurement to be performed (diffraction, inelastic scattering, stress scanning, etc.). Please include scientific context; relevance of proposed experiment; results from any previous work performed; proposed method of data analysis.

Literature information implies that there exist a series of compounds of a general formula $M_2FeV_3O_{11}$ in the three-component metal oxide systems of $MO - V_2O_5 - Fe_2O_3$ type, where $M = Mg, Zn$ and Ni [1, 2]. The structures of $Zn_2FeV_3O_{11}$ and $Mg_2FeV_3O_{11}$ were well described [2]. These compounds crystallize in the triclinic system and are isotypic to $Mg_{1.7}Zn_{0.3}GaV_3O_{11}$ [3, 4], whereas the structure of $Ni_2FeV_3O_{11}$ has not yet been described, and only the basic crystallographic parameters of this compound are determined up to now [5]. New ternary vanadates with comparable structures have been prepared at Szczecin University of Technology, Poland, by replacing the iron atoms in $M_2FeV_3O_{11}$ with chromium atoms. Samples of $M_2CrV_3O_{11}$ compounds being formed in the $MO - V_2O_5 - Cr_2O_3$ ($M = Mg, Zn$) ternary systems have recently been synthesized [6, 7]. The structure of these new vanadates has been refined favourably only for the magnesium chromium vanadate, $Mg_2CrV_3O_{11}$ [8]. Structural features of $Zn_2CrV_3O_{11}$ compound (isostructural to well know $Zn_2FeV_3O_{11}$) require more investigations. Basing on the XRD and neutron diffraction comparable data, analyzed using Rietveld refinement method we are going to refine the structure.

Tak, rzeczywiście, próbek z Ni nie będziemy mierzyć.

Monika Bosacka pracuje nad tym by próbki były jednofazowe, po każdym procesie wyprażania analizuje widma RTG. Już właściwe próbka z Mg jest gotowa, na dniach będzie gotowa próbka z Zn.

Jeśli uzna Pan, że wniosek jest już gotowy, to chyba można wysłać do Pana Cranswicka. No i oczywiście nikt nie wybiera się na te pomiary, bo tak jak Pan pisze, nikt nie sfinansuje takiej podróży.

- [1] I.Rychłowska-Himmel and A.Blonska-Tabero: *J. Therm. Anal. Cal.* 56 (1999) p. 205
- [2] X.Wang, D.A.Vander Griend, Ch.L.Stern and K.R.Poeppelmeier: *J. Alloys Comp.* 298 (2000) p. 119-124
- [3] C.Müller and H.Müller-Buschbaum: *J. Alloys Compd.* 185 (1992) p. 163
- [4] C.Müller and H.Müller-Buschbaum: *J. Alloys Compd.* 191 (1993) p. 251
- [5] M.Kurzawa, A.Blonska-Tabero, I.Rychłowska-Himmel and P.Tabero: *Mater. Res. Bull.* 36 (2001) p. 1379
- [6] M. Kurzawa, I. Rychłowska–Himmel, A. Blonska–Tabero, M. Bosacka and G. Dabrowska, A New Compound $Mg_2CrV_3O_{11}$ and Phase Relations in the $MgV_2O_6 - MgCr_2O_4$ System in the Solid State, *Solid State Phenom.*, 90-91(2003) 353
- [7] M. Kurzawa, M. Bosacka, Synthesis and Characterization of New Compounds $Ni_2CrV_3O_{11}$ and $Zn_2CrV_3O_{11}$, *Solid State Phenom.*, 90-91 (2003) 347
- [8] A. Worsztynowicz, S.M. Kaczmarek, W. Paszkowicz, R. Minikayev, Crystal structure of magnesium chromium vanadate $Mg_2CrV_3O_{11}$, a member of $A_2BV_3O_{11}$ vanadate family, *Powder Diff.*, in the print