2019 - SUSTAINABLE INDUSTRIAL PROCESSING SUMMIT & EXHIBITION

23-27 October 2019, Coral Beach Resort, Paphos, Cyprus

ANGELL
INTERNATIONAL SYMPOSIUM
on Molten Salt, Ionic and Glass-forming Liquids

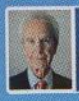
FLINK
INTERNATIONAL SYMPOSIUM
on Sustainable Production of Ferro-alloys

KOBE
INTERNATIONAL SYMPOSIUM
on Science of Innovative and Sustainable Alloys and Magnets

KOZLOV
INTERNATIONAL SYMPOSIUM
on Sustainable Materials Recycling Processes and Products

MCNEIL
INTERNATIONAL SYMPOSIUM
on Laws and their Applications for Sustainable Development

PARAMESWARAN
INTERNATIONAL SYMPOSIUM
on Sustainable Mining and Smelting



SCHREFLER
INTERNATIONAL SYMPOSIUM
on Geomechanics and Applications for Sustainable Development

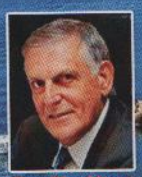
USUI
INTERNATIONAL SYMPOSIUM
on Advanced Sustainable Iron and Steel Making

TRESSAUD
INTERNATIONAL SYMPOSIUM
on Solid State Chemistry for Applications & Sustainable Development

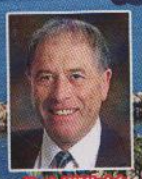
VAYENAS
INTERNATIONAL SYMPOSIUM
on Physical Chemistry and its applications for sustainable development

PROGRAM

Featuring 6 Nobel Laureates:



Dan Shechtman
2011 - Chemistry



Kurt Wüthrich
2002 - Chemistry

Ferid Murad
1998 - Medicine

Rudy A. Marcus
1992 - Chemistry

Yuan T. Lee
1986-Chemistry

Klaus V. Klitzing
1985-Physics

Special Address:

Donna J. Nelson
2016 President
American Chemical Society

Subra Suresh
President, NTU Singapore
former Director NSF, USA

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Tressaud International Symposium on Solid State Chemistry for Applications and Sustainable Development
Paper Id: 53 [Abstract]

SESSION 5:
ChemistryFriAM-R9

Complex Fluorides and Oxyfluorides: Successive Ferroelastic Phase Transitions and Barocaloric Effect

Igor Flerov[1]; Mikhail Gorev[1]; Evgeniy Bogdanov[1];
[1]KIRENSKY INSTITUTE OF PHYSICS, Krasnoyarsk, Russian Federation;
Type of Paper: Invited
Type of Presentation: Oral
Id Paper: 27
Topic: 52

In recent years, caloric effects near phase transitions in solids have attracted growing interest from investigators. First, this is due to the possibility of obtaining information about a direct relationship between fundamental values such as entropy, temperature, order parameter, structural disorder and sensitivity to external fields (electric, magnetic, mechanical stress and hydrostatic pressure). [1,2] The second reason is associated with the actual problem of searching for high-performance solid refrigerants and for designing alternative refrigeration cycles which are competitive compared to the traditional vapor-compression cycles. [3,4] Barocaloric effect (BCE) associated with the reversible change in the entropy/temperature, ΔS_{BCE} / ΔT_{AD}, under pressure variation under the isothermal/adiabatic conditions is a common caloric characteristic for substances of different physical nature.
We performed the analysis of the extensive and intensive BCE in some complex fluorides and oxyfluorides which are very sensitive to a change of the chemical pressure and very often undergo successive order-disorder phase transitions of a ferroelastic nature. Different types of the T - p phase diagrams, including the triple points, are considered in connection with the complicated dependences of T(p) observed experimentally. Analyzed diagrams do not cover all possible variants of the phase transition temperature behavior under pressure. They show, however, which parameters of the phase transitions and phase diagrams should be taken in consideration when analyzing BCE. A very important point is that rather low hydrostatic pressure practically does not affect the entropy of the ferroelastic transformations. Therefore, the behavior of extensive and intensive BCE is not changed with increase in pressure. In the case of close temperatures of the successive phase transitions, there is a possibility to realize extensive BCE as the sum of entropies of two transformations. Due to the large magnitude of the extensive and intensive BCE, complex fluorides and oxyfluorides can be considered as new competitive solid refrigerants.

Keywords:
Design of materials for sustainable energy production;

References:
[1] A.M. Tishin and Y.I. Spichkin, The Magnetocaloric Effect and its Applications (Bristol: Institute of Physics Publishing) 2003.
[2] I.N. Flerov, M.V. Gorev, A. Tressaud, N.M. Laptash, Cryst. Rep. 56 (2011) 9-17.
[3] L. Manosa, A. Planes, M. Acet, J. Mater. Chem. A 1 (2013) 4925-4936.
[4] M. Ožbolt, A. Kitanovski, J. Tušek, A. Poredoš, Int. J. Refrig. 40 (2014) 174-88.