Title: Heusler Compounds: Multifunctional Materials for Spintronics

Speaker:
Prof. Claudia Felser
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Venue: Room 603, Chow Yei Ching Building,
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Abstract:
Tremendous progress has been made recently in the development of magnetic Heusler compounds specifically designed as materials for spintronic applications [1]. While problems in the field of spintronics remain, the use of half-metallic Heusler compounds provides a prospect for novel solutions. Heusler compounds can be made with high spin polarization and high Curie temperature as well as high spin injection efficiency, either very low or high damping, tunable magnetic moment (low and high magnetic moments can be realized), and tunable anisotropy. There is, therefore, great potential that many materials-related problems present in current-day 3d metal systems can be overcome. The handling of interfaces with respect to their chemical properties (atomic diffusion and roughness), electronic properties (e.g., Schottky barrier design), and spin properties (injection and pumping) remains a big challenge. The potential exists for new phenomena and applications with the use of novel materials in the Heusler compound family - for example, the use of semi-conducting Heusler compounds as non-ferromagnetic spin conductors. High spin polarization and high Curie temperatures were found in Co2-Heusler compounds, with Curie temperatures up to 1120 K in Co2FeSi. Mn2YZ compounds (Y = Mn, Cr; Z = Al, Ga, Si, Ge, Sb) such as Mn3Ga are ferrimagnets with low magnetic moments despite their high Curie temperatures. Due to the Jahn Teller instability of manganese in these materials, some of them show a tetragonal distortion, which renders out-of-plane magnetization in thin films possible. Semiconducting half-Heusler compounds such as TiNiSn have attracted attention as potential candidates for thermoelectric applications. These complex C1b

compounds can be designed as n- and p-type thermoelectrical materials with exceptionally large figure of merit, ZT≈1.5 at high temperatures. The potential for applications of these ternary compounds as rationally designed, multifunctional materials will be discussed.

Biography of the speaker:

Claudia Felser earned her diploma in chemistry at the University of Cologne in 1989 and completed her doctorate in physical chemistry there in 1994. After postdoctoral fellowships at the MPI in Stuttgart and the CNRS in Nantes (France), she joined the University of Mainz. She was a visiting scientist at Princeton University (USA) and a visiting professor at the University of Caen (France). She became a full professor at the University of Mainz in 2003. She is the chair of the DFG research group "New Materials with High Spin Polarization" and is the director of the Graduate School of Excellence "Materials Science in Mainz" of the German Science Foundation (DFG). She was honored with the order of merit "Landesverdienstorden" of the state RhinelandPalatinate for the foundation of a lab for students at the University of Mainz. Prof. Felser has written more than 150 articles and been granted several patents. Her recent research focuses on the design of new materials for spintronics and energy technologies such as solar cells, thermoelectric materials, and superconductivity. The materials under investigation are Heusler compounds and compounds with related structure type.

Organizer: Dr. P.W.T. Pong

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