Constitution and Structural Chemistry of T-Mn Systems (T = Sc to Ta)

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Manganese is one of the important alloying partners in many structural alloy systems with Laves-phases as the dominant preciptitates. Consequently, the T-Mn phase diagrams (T is an early transition metal from Sc to Ta) and the TMn_2 Laves phases are part of numerous ternary and higher order systems of technological importance, involving hydrogen storage materials, high strength steels (exceeding a yield strength of 700 MPa) and intermetallics in aerospace and/or earth-bound turbine applications and last but not least high strength materials for biomedical applications.

Based on our systematic investigations (phase relations, X-ray and neutron structure analyses, SEM, TEM electron diffraction and physical property studies) of binary and ternary Laves phase systems with Mn, the presentation will provide a comprehensive overview on (i) the structural chemistry of the corresponding Mn-based Laves phases, (ii) their thermodynamic stability from calorimetric measurements but also from DFT calculations, (iii) the phase relations in binary T-Mn systems including CALPHAD-type thermodynamic assessments, and (iv) evaluation of physical properties (resistivity, magnetism, specific heat) including also mechanical properties.