Title: U in metastable systems: structure, magnetism, and superconductivity

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Abstract: This thesis presents studies of U-Nb and U-Ti alloys and hydrides synthesized via different technological paths. Investigation of the microstructure of the alloys with different concentrations of Ti (Nb) allowed to find the optimum setting for stabilization of the metastable *bcc* U allotrope. Ultra-fast cooling accompanied by alloying leads to retention of materials with high degree of atomic disorder apparent from the studies of their transport properties. The alloys exhibit a weakly paramagnetic ground state and low-temperature superconductivity, the critical temperature of which has only moderate variations with Ti (Nb) concentrations and which has very high upper critical fields.

Interaction with hydrogen allows to stabilize two distinctive forms of hydride: β-UH_3 and UTi_2H_x. β-UH_3 alloyed by Ti (Nb) orders ferromagnetically with transition temperatures exceeding 170 K, weakly influenced by the concentration of the transition elements. Development of the density of electronic states at the Fermi level was monitored by the studies of heat capacity. The results were interpreted in the context of variations of U-U spacing.

UTi_2H_x represents a cubic Laves phase AB_2, which is, however, in this case not form without hydrogen. This hydride can accommodate different concentrations of hydrogen. Investigation of magnetic properties reveals the possibility of stabilization of magnetic UTi_2H_6 and non-magnetic UTi_2H_5. Transport and thermodynamic properties of UTi_2H_5 characterize this material as a spin fluctuator poised at the verge of magnetic ordering.

Keywords: Uranium, Superconductivity, Hydride, Strong Correlations