Title: Superconductivity and electronic properties of γ-U alloys and their hydrides.

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Abstract: Low-temperature electronic properties for U-Mo and U-Zr splats stabilized in γ-U were investigated. Magnetic measurements revealed Pauli paramagnetic behavior with temperature independent susceptibility for U-Mo alloys. U-Mo and U-Zr splats become superconducting at low temperatures with T_c up to 2.1 K and critical field 5-6 T. The superconductivity of γ-U can be considered as a bulk effect and can be described by the BCS theory, while α-U superconductivity is not a real bulk effect.

U-Mo and U-Zr alloys absorb hydrogen at high pressures ($p \geq 4.5$ bar) and form hydrides with stoichiometry analogous to UH_3. The hydrides with Mo have an amorphous structure based on β-UH_3 phase, while hydrides with Zr have a crystalline structure of the α-UH_3 type. $(UH_3)_{1-x}Mo_x$ hydrides are ferromagnetic with enhanced T_C up to 202 K and magnetic moments 1.1 μ_B/U in comparison with pure β-UH_3 (175 K; 0.87 μ_B/U). This is probably the first U-based ferromagnet with such a high T_C. The coercive field of $(UH_3)_{1-x}Mo_x$ and $(UH_3)_{1-x}Zr_x$ hydrides reaches values up to 4-6 T at low temperatures. Abrupt jumps are observed during the demagnetization process. Despite different crystal structure and inter-U spacing, the electronic properties of α-UH_3 phase are very similar to β-UH_3.

Keywords: Uranium; superconductivity; ferromagnetism; hydrides