The aim of this thesis is to investigate the properties of correlated fermions on optical lattice with spin-dependent disorder. The system is modeled by an Anderson-Hubbard Hamiltonian on a bipartite Bethe lattice with the on-site potential treated as a random variable drawn from the spin-dependent probability distribution function. The solution of this model is obtained within the dynamical mean-field theory with geometric average over the disorder realization. This method treats disorder and interaction on equal footing and is sensitive to the Anderson localization on single-particle level. In the thesis two scenarios are discussed: (i) paramagnetic case, where the instability towards forming a magnetic long-range order is blocked, and (ii) staggered magnetic case, where this instability is enabled.

In case (i) the paramagnetism is imposed by forcing the equivalence of the solution on both sublattices. Thanks to this one can focus solely on the competition between the disorder (Δ) and interaction (U). The obtained phase diagram for this case shows the existence of three phases: metal, disordered Mott insulator and spin-selective localized phase. Oppose to the conventional disorder case where the interaction and randomness competed, in the spin-dependent case these two factors cooperate in order to drive the system into the insulating phase. The reason being that breaking the spin symmetry affects directly the efficiency of the process that leads to the quasiparticle resonance formation. This is why the transition lines on the $U-\Delta$ phase diagram are tilted towards the lower interaction strengths. Because of the spin-dependence of the disorder a novel spin-selective localized phase has been observed at high disorder strengths. It is characterized by the coexistence of itinerant fermions in the spin channel not directly affected by the randomness and localized carriers in the other spin channel. This phase is separated form the insulating phase by a disorder strength independent line of transition points, which reflects the Falicov-Kimball-like nature of the spin-selective localized phase.

In case (ii) the possibility of forming an magnetic long-range order was included in the model by treating the sublattices separately. The resulting phase diagram shows five distinct phases with four different spin ordering. Starting at small Δ the system is an insulator with anti-parallel ordered spins, which reflects the natural tendency of the half-filled Hubbard model to form an insulator with an antiferromagnetic order. Due to the spin-dependence of the disorder the magnetization on the subalttices does not have the same absolute value, but becomes reduced in case when the majority spin is directly affected by the disorder. At higher Δ and small U first the gap in one spin channel is closed (spin-selective localized phase of type I) and at even higher disorder strengths the system becomes a ferromagnetic metal. Finally, at large enough Δ the system turns into a spin-selective localized phase of type

II. It is a counterpart of the spin-selective localized phase in paramagnetic case but with a magnetic order. As in previous case this phase boarders with insulator (insulator of type II) on a Δ-independent line of transition points. Lastly, when Δ and U is large the system becomes an insulator of type II. Which is characterize by a broad spectral gap and a SDW ferromagnetic order.