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Bose glass vs. Mott glass in site-diluted S=1 Heisenberg antiferromagnets TOMMASO ROSCILDE, Max-Planck-Institut fuer Quantenoptik - Germany, STEPHAN HAAS, Department of Physics and Astronomy - USC — Making use of large-scale quantum Monte Carlo simulations, we investigate the ground-state phase diagram of the square-lattice S=1 Heisenberg antiferromagnet with strong single-ion anisotropy and in presence of site-dilution of the magnetic lattice. Mapping the spins onto Holstein-Primakoff bosons, the single-ion anisotropy is seen to play the role of a repulsive on-site potential for the bosons. The clean limit of the model shows an anisotropy-driven quantum phase transition from an XY ordered (superfluid) phase to a quantum disordered (Mott insulating) phase. A similar transition is also driven by the application of a uniform field on the disordered state. Adding site dilution to the model, the non-trivial interplay between quantum fluctuations and lattice randomness gives rise to a novel quantum-disordered Mott-glass phase in zero field, with a gapless spectrum and yet a vanishing uniform susceptibility. Upon applying a field, such phase is turned into a Bose glass, with gapless spectrum and finite susceptibility. The above picture is directly relevant for experiments on doped quasi-low-dimensional Ni compounds, such as the recently investigated $NiCl_2$-$4SC(NH_2)_2$ (V.S. Zapf et al., condmat/0505562).

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