On nonlinear damped wave equations for positive operators

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In this research we study a Cauchy problem for the nonlinear damped wave equations for a general positive operator with discrete spectrum. We derive the exponential in time decay of solutions to the linear problem with decay rate depending on the interplay between the bottom of the operator's spectrum and the mass term. Consequently, we prove global in time well-posedness results for semilinear and for more general nonlinear equations with small data. Examples are given for nonlinear damped wave equations for the harmonic oscillator, for the twisted Laplacian (Landau Hamiltonian), and for the Laplacians on compact manifolds.