Superdeformation and High-Spin Spectroscopy Studies on ^{174}Hf

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High-spin states of the nucleus ^{174}Hf were populated using the heavy-ion reactions at the Atlas accelerator facility at the Argonne National Laboratory and the 88" cyclotron facility at the Lawrence Berkeley National Laboratory. The de-exciting γ rays are detected with the GAMMASPHERE spectrometer. In this nucleus, eight superdeformed bands are observed for the first time. Studies on these bands as well as eight bands with normal deformation are performed. The hypothesis for presence of a triaxial shape at high deformation in ^{174}Hf was tested via lifetime measurements of the states of the superdeformed structures. The deduced quadrupole moments of four of the these bands were compared with the Ultimate Cranker calculations and an additional search for transitions that depopulate these structures was carried out. Results from the study of these bands for possible presence of triaxiality in ^{174}Hf is presented. The investigation of the bands with normal deformation employed an extensive systematics of crossing frequencies, alignments, and Routhians. CSM and TRS calculations were performed and compared with these observables. Quasiparticle configurations for all of the bands with normal deformation were proposed, and $B(M1)/B(E2)$ and $B(E1)/B(E2)$ transition strength ratios were analyzed.