

Suppressed Electric Quadrupole Collectivity in ^{49}Ti Relative to Semi-Magic ^{50}Ti

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Single-step Coulomb excitation of $^{46,48,49,50}\text{Ti}$ is presented. A complete set of E2 matrix elements for the quintuplet of states in ^{49}Ti , centered on the 2^+ core excitation, was measured for the first time, using the CLARION2-TRINITY arrays [1]. A total of nine E2 matrix elements are reported, four of which were previously unknown. ^{49}Ti shows a 20% quenching in electric quadrupole transition strength as compared to its semi-magic ^{50}Ti neighbour. This 20% quenching is empirically unprecedented, and contrary to the enhancement recently observed in ^{129}Sb relative to a ^{128}Sn core [2]. Both cases are near double-magic nuclei and have small core $B(E2)$ values. The quenching in ^{49}Ti can be explained with a remarkably simple two-state mixing model, which is also consistent with other ground-state properties such as the magnetic dipole moment and electric quadrupole moment. The simplicity of the ^{49}Ti - ^{50}Ti pair (i.e., approximate single-j $0f_{7/2}$ valence space and isolation of yrast states from non-yrast states) provides a unique opportunity to disentangle otherwise competing effects in the ground-state properties of atomic nuclei, the emergence of collectivity, and the role of proton-neutron interactions.

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[1] T.J. Gray, J.M. Allmond et al., Nucl. Instrum. Methods A 1041, 167392 (2022)

[2] T.J. Gray, J.M. Allmond et al., Phys. Rev. Lett. 124, 032502 (2020)

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