

High spin yrast states in even platinum isotopes

ASHOK KUMAR and M R GUNYE

Theoretical Reactor Physics Section, Bhabha Atomic Research Centre, Trombay, Bombay 400 085, India

MS received 7 June 1980; revised 12 September 1980

Abstract. The high spin yrast states up to $J = 20^+$ in $^{184}, ^{186}\text{Pt}$ and $^{190}, ^{192}, ^{194}\text{Pt}$ are studied in a microscopic approach of variation with number-conserved projected states. The energy spectra, quadrupole moments and $B(E2)$ values are calculated by employing the Hamiltonian with quadrupole plus pairing interactions. The results of the calculations are in fair agreement with the available experimental data.

Keywords. Nuclear structure; platinum isotopes; energy spectra; quadrupole moments; $B(E2)$ values.

1. Introduction

The nuclei of tungsten, osmium and platinum form an important region of transition from the deformed rare-earth nuclei to the spherical ^{208}Pb and for this reason are of special interest in testing the predictions of different nuclear models. These transition nuclei provide a probe for studying the details of nuclear collective motion. The collective properties of the low-lying states of the heavy transitional nuclei are investigated (Davydov and Fillipov 1958; Davydov and Chaban 1960; Das Gupta and Gunye 1963; Faessler *et al* 1965) in various collective models developed on the basis of different equilibrium shapes for these nuclei. Extensive theoretical studies on the equilibrium deformations of the transition nuclei have been carried out in the framework of the Nilsson model by incorporating pairing correlations (Gunye *et al* 1964) and the quadrupole plus pairing model (Kumar and Baranger 1968). The nuclear shape changes from prolate to oblate in the mass region $A \sim 188$ (Gunye *et al* 1964; Kumar and Baranger 1968). Thus the nuclei $^{184}-^{186}\text{Pt}$ have prolate shape, ^{188}Pt is axially asymmetric whereas $^{190}, ^{192}, ^{194}\text{Pt}$ prefer an oblate equilibrium shape (Kumar and Baranger 1968). Nuclear structure studies, both experimental and theoretical, in osmium and platinum nuclei are being pursued with great interest in recent years. The back-bending phenomenon observed (Sorensen 1973; Johnson and Szymanski 1973) in some deformed rare-earth nuclei gave a stimulus to investigate high spin states in heavy nuclei. Recent experiments have established (Hjorth *et al* 1976; Cunnane *et al* 1976; Johnson *et al* 1977; Beshai *et al* 1976; Piiparinen *et al* 1975) the energy spectra of even platinum isotopes up to high spin states with $J \leq 20$. A pronounced back-bending at the critical angular momentum $J_c = 10$ is observed in the yrast band of $^{190}, ^{192}, ^{194}\text{Pt}$ isotopes. The analysis of the available data on the low-lying states in ^{194}Pt indicates (Baktash *et al* 1978) that the quadrupole plus pairing force model is favoured over the triaxial rigid ro-