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快报

g玻色子对^{100}Pd核高自旋态能谱的影响

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摘要 以新近的实验单粒子能量为输入，应用唯象sdgIBM理论的两种微观实现——微观sdgIBM-2方案和sdgIBM-F$_{max}$方案，仔细研究^{100}Pd的核能谱和 B (E2)跃迁。计算结果表明:sdgIBM-2方案成功地再现了^{100}Pd核的较复杂的基态带和γ带的高角动量态能谱以及已知的 B (E2)跃迁，其再现角动量达$J^{\pi}=16^{+}$、$E_x\approx7$ 00 MeV，比通常IBM理论再现的$J^{\pi}=6^{+}$~8^{+}、$E_x\approx2$ 00 MeV高出很多;指认直到16^{+}的yrast态都是基态，很可能目前观测到的yrast带中根本就不存在玻色子破对后的准粒子态。理论分析和数值计算进一步表明，为了能在IBM理论框架下描述好核的高角动量基态，需要平权地引入g玻色子，以便提供较强的十六极对相互作用，抵抗住高速转动下玻色子的破对趋势。用g玻色子数为0~3的弱耦合sdgIBM-F$_{max}$方案的计算结果对此作了进一步说明。按照微观sdgIBM 2方案，解释了实验上3个14^{+}态的异常:14^{+}_1态是由于1个中子g玻色子在转变为中子d玻色子的量子相变中辐射出1对光子的结果，14^{+}_2 是16^{+}_1 态退耦的中间态，而14^{+}_3是真正的基态。

关键词 微观sdgIBM-2方案 g玻色子 量子相变 ^{100}Pd核

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Effect of g-Boson on Spectra of High Spin States in ^{100}Pd Nucleus

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Abstract By using a microscopic sdgIBM-2 approach which is the accomplishment of the phenomenological sdgIBM theory and the experimental single-particle energies, the levels of the more complex ground-state band and the high-angular momentum states of γ-band on ^{100}Pd nucleus are successfully reproduced. The ground state band and γ-band are described well up to $J^{\pi}=16^{+}$ and $E_x\approx7$ 00 MeV, and that is larger than that $J^{\pi}=6^{+}$-8^{+}, $E_x\approx2$ 00 MeV can be successfully reproduced in IBM theory. It has been proved that its yrast states up to the 16^{+} state are ground states, there may not exist any broken pair quasi-particle state by boson in yrast states. Theoretical analysis and numerical calculation show that to describe successfully spectra on ^{100}Pd nucleus underthe boson approach in IBM theory, it is impossible that the g-boson has been not considered in one. According to the microscopic sdgIBM-2 approach, the 14^{+}_1 state is understood as a result that a neutron g-boson transites into a neutron d-boson and a pair of photos is radiated at same time, and the 14^{+}_2 state is the decoupling state of the 16^{+}_1 state, while the 14^{+}_3 state is the actual ground state.

Key words microscopic sdgIBM-2 approach g-boson quantum phase transitio

n _ ^{100}Pd nucleus

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