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Investigation of ultraviolet spectrum and energy level assignments of Gd I in the 305–325nm region

摘要

本文利用共振电离光谱技术研究了 305–325 nm 范围内钆原子的紫外光谱，共获得了 196 条跃迁谱线，其中包括 66 条强线。通过结合已有文献数据和泵浦-探测技术验证，共标识了 190 条谱线的跃迁上下能级，其中 172 条为首次报道。同时，还首次标识了 17 个偶宇称高激发态能级。本文报道的强线将有助于未来对钆原子类氢态和自电离态的研究，并实现用于共振电离质谱分析的双色、两步光电离路径。

关键词

钆原子，紫外光谱，共振电离光谱，泵浦-探测技术

Abstract

The ultraviolet spectrum of Gd I in the 305–325 nm range was studied using resonance ionization spectroscopy, revealing 196 transition lines, including 66 strong ones. The lower and upper energy levels were assigned to 190 lines by combining available reference data with pump–probe verification, 172 of which are reported for the first time. Seventeen new even-parity high-lying excited states were also identified. The strong lines reported here will contribute to future studies of Gd I Rydberg and autoionization states and enable two-color, two-step photoionization pathways for and resonance ionization mass spectrometry analysis.

Keywords

Atomic gadolinium, Ultraviolet spectrum, Resonance ionization spectroscopy, Pump-probe technique

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