Third-order many-body perturbation theory calculations for low-lying states in beryllium

HUNG-CHEUK HO, W.R. JOHNSON, S.A. BLUNDELL

University of Notre Dame —

A detailed breakdown of many-body perturbation theory (MBPT) contributions through third order is presented for energies of the ten \( (2l, 2l') \) states of beryllium. A total of 84 one-body and 578 two-body terms contribute to the third-order energy. Third-order MBPT calculations for monovalent atoms were carried out fifteen years ago by Blundell et al.[1] Second-order calculations for ions of the beryllium-like isoelectronic sequence were also reported six years later[2]. In that paper, only 4 one-body and 20 two-body terms contribute to the second-order energy of neutral Be. The agreement with experimental energies was at 5% level. Our study aims to present complete third-order MBPT formulas, and apply them to the simplest two-valence particles system beryllium to improve the agreement with experiment.


1Supported in part by NSF Grant No. PHY-0139928
2Present Address: CEA-Grenoble, France

W.R. Johnson
University of Notre Dame

Date submitted: 28 Jan 2005