

## Dielectronic recombination of berylliumlike $\text{Xe}^{50+}$ ions: Measurement and theoretical calculations

D. Bernhardt<sup>\*1</sup>, C. Brandau<sup>\*,†</sup>, C. Kozhuharov<sup>§</sup>, A. Müller<sup>\*</sup>, S. Schippers<sup>\*</sup>, S. Böhm<sup>\*</sup>,  
 F. Bosch<sup>§</sup>, Z. Harman<sup>†,‡</sup>, J. Jacobi<sup>\*</sup>, S. Kieslich<sup>\*</sup>, H. Knopp<sup>\*</sup>, P. H. Mokler<sup>\*,‡</sup>,  
 F. Nolden<sup>§</sup>, W. Shi<sup>\*</sup>, Z. Stachura<sup>¶</sup>, M. Steck<sup>§</sup>, Th. Stöhlker<sup>§,\*,◇</sup>

<sup>\*</sup> Institut für Atom- und Molekülphysik, Justus-Liebig-Universität, D-35392 Giessen, Germany

<sup>†</sup> ExtreMe Matter Institute EMMI and Research Division,

GSI Helmholtzzentrum für Schwerionenforschung, D-64291 Darmstadt, Germany

<sup>‡</sup> Max-Planck-Institut für Kernphysik, D-69117 Heidelberg, Germany

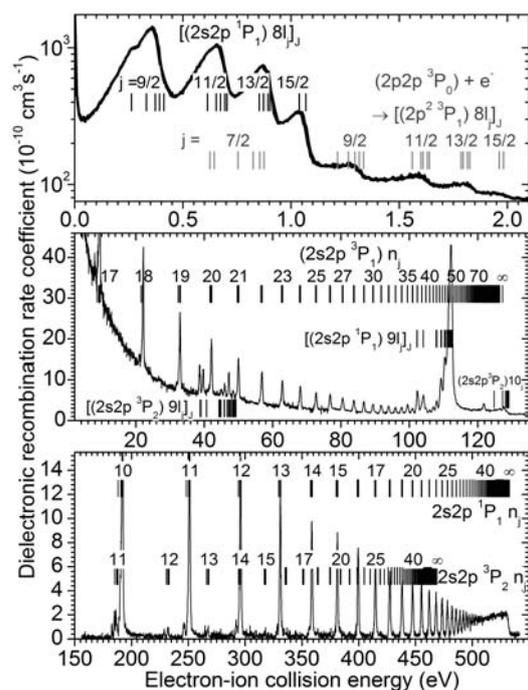
<sup>§</sup> GSI Helmholtzzentrum für Schwerionenforschung, D-64291 Darmstadt, Germany

<sup>¶</sup> Instytut Fizyki Jądrowej, PL-31-342 Kraków, Poland

<sup>\*</sup> Institut für Optik und Quantenelektronik, Friedrich-Schiller-Universität Jena, D-07743 Jena, Germany

<sup>◇</sup> Helmholtz-Institut Jena, D-07743 Jena, Germany

**Synopsis** Absolute rate coefficients for dielectronic recombination (DR) of Be-like  $^{136}\text{Xe}^{50+}$  have been measured at the heavy-ion storage ring ESR. The experimental results are compared with relativistic distorted-wave calculations employing the multiconfiguration Dirac-Fock method. Based on the DR measurements, multiple intra-L-shell excitation energies were determined.



**Figure 1.** Measured  $^{136}\text{Xe}^{50+}$ -DR spectrum (black line) and calculated DR resonance positions (black and gray vertical bars for the initial  $2s^2\ ^1S_0$  and  $2s2p\ ^3P_0$  states, respectively) using core excitation energies from [1] and Rydberg electron binding energies. For principal quantum numbers  $n \leq 9$  Rydberg binding energies were determined by using the Los Alamos atomic physics program package [2]. States with  $n \geq 10$  were assumed to be hydrogenlike with Dirac binding energies.

<sup>1</sup>E-mail: Dietrich.Bernhardt@iamp.physik.uni-giessen.de

Absolute DR-rate coefficients of Be-like  $^{136}\text{Xe}^{50+}$  have been measured at the experimental storage ring (ESR). The experimental center-of-mass energy range (0–540 eV) covers all resonances associated with the  $2s^2+e^- \rightarrow (2s2p_{j'}nl_j)_J$  DR processes (figure 1). For the predominant  $(2s2p_{1/2}\ ^3P_1)_n$  and  $(2s2p_{3/2}\ ^1P_1)_n$  DR-resonance series the strengths and energies of isolated DR-resonance groups have been determined for principal quantum numbers  $n$  up to 34. In addition to the prominent ground-state DR, also resonances associated with metastable  $^{136}\text{Xe}^{50+}$  ( $2s2p\ ^3P_0$ ) parent ions were observed at energies between 1.2 and 2.2 eV [3]. By extrapolating DR resonance positions to  $n \rightarrow \infty$ , the  $2s^2\ ^1S_0 - 2s2p_{1/2}\ ^3P_1$ ,  $2s2p_{3/2}\ ^3P_2$ ,  $2s2p_{3/2}\ ^1P_1$  and  $2s2p_{1/2}\ ^3P_0 - 2p_{1/2}2p_{3/2}\ ^3P_1$  excitation energies were determined with relative accuracies of the order of  $10^{-4}$ . In addition to our experimental measurements we have performed relativistic distorted-wave calculations employing the multiconfiguration Dirac-Fock (MCDF) method [4].

### References

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