

# Contents

## Part I Photon Absorption

<b>1</b>	<b>Main Points of the Theory of Photoabsorption</b>	<b>3</b>
1.1	Most Important on Photoionization	3
1.2	Single Electron Hartree–Fock (HF) Approximation	5
1.3	Diagrammatical Technique	7
1.4	Many-Body Perturbation Theory	11
1.5	Random Phase Approximation with Exchange	13
1.6	Generalizations of RPAE	18
1.7	Calculation Procedures	19
1.8	Angular Anisotropy Parameter	22
1.9	Other Characteristics of Photoionization	28
1.10	Semiclosed Subshells Atoms	29
1.11	Open Shell Atoms	32
1.12	Negative and Positive Ions	34
1.13	Endohedral Atoms: The Effect of Electron Reflections	35
1.14	Endohedral Atoms: The Effect of Fullerene Polarization	39
1.15	Two-Shell Endohedrals	43
1.16	Current Induced by Photon Momentum	46
1.17	Inelastic Photoelectron Scattering	47
1.18	Satellite Excitation	49
1.19	Two-Electron Photoionization and Recombination	51
1.20	Photoionization of the Excited Atoms	54
1.21	Electron Correlations in RPAE at High Photon Energy	54
1.22	Electron Correlations at High Photon Energy Out of RPAE Frame	58
	References	59
<b>2</b>	<b>Results of Calculations</b>	<b>65</b>
2.1	Data Representation and Used Formulas	65
2.2	Atoms and Ions of Noble Gases	70

2.3	Atoms and Ions of Group I Elements of the Periodic Table .....	123
2.4	Atoms and Ions of Group II Elements of the Periodic Table .....	166
2.5	Ions and Atoms of Group III Elements of the Periodic Table .....	188
2.6	Ions and Atoms of Group IV Elements of the Periodic Table .....	218
2.7	Atoms and Ions of Group V Elements of the Periodic Table .....	232
2.8	Atoms and Ions of VI Group Elements .....	248
2.9	Atoms and Ions of VII and VIII Group Elements .....	265
2.10	Endohedral A@C <sub>60</sub> Atoms and Ions .....	306
2.11	Onion-Type Endohedral Atoms A@C <sub>60</sub> @C <sub>240</sub> .....	390
	References .....	414

## Part II Electron Scattering

<b>3</b>	<b>Main Points of the Electron Scattering Theory .....</b>	<b>421</b>
3.1	Most Important on Electron–Atom Scattering .....	421
3.2	Elastic Scattering in One-Electron Approximation .....	427
3.3	Polarization Interaction .....	428
3.4	Dyson Equation .....	431
3.5	Inelastic Scattering of Slow and Medium Energy Electrons .....	432
3.6	Inelastic Scattering of Fast Particles .....	433
3.7	Angular Distribution of Knocked-out Electrons .....	438
3.8	The Compton Effect .....	444
3.9	GOS for Semi-filled Shells .....	448
3.10	Inelastic Scattering of Fast Particles upon Endohedrals .....	450
3.11	Bremsstrahlung of Fast Particles .....	456
3.12	Positron Scattering with Account of Polarization Interaction .....	459
	References .....	462
<b>4</b>	<b>Electron Scattering: Results of Calculations .....</b>	<b>465</b>
4.1	Data Representation and Used Formulas .....	465
4.2	Atoms of Noble Gases .....	467
4.3	Atoms and Some Ions of Group I Elements of the Periodic Table .....	574
4.4	Atoms of Group II Elements of the Periodic Table .....	605
4.5	Atoms and Ions of Groups IV and V Elements of the Periodic Table .....	639
4.6	Ions of Group VII Elements of the Periodic Table .....	644
4.7	Endohedral A@C <sub>60</sub> Atoms .....	648
4.8	Brief Discussion of Results .....	669
	References .....	676

## Part III Vacancies Decay

<b>5</b>	<b>Main Points on Vacancies Decay Theory .....</b>	<b>681</b>
5.1	Most Important About Vacancies and Their Decay .....	681
5.2	The Energies of Atomic Levels .....	684

5.3	Polarization Interaction for Vacancies .....	685
5.4	Self-energy Part of Green's Function and Spectroscopic Parameters .....	686
5.5	Satellite Lines Shapes in Photoelectron Spectra .....	696
5.6	Effects in Interaction Between Satellite States .....	699
5.7	Radiative Decay .....	701
5.8	Nonradiative or Auger Decay .....	705
5.9	Line Shapes of Low-Energy Auger Spectra .....	710
5.10	Two-Electron and Radiative Auger Decay .....	711
5.11	Single Photon Decay of Two-Hole States .....	714
5.12	Auger and Radiative Decay of Excited States .....	715
5.13	Angular Anisotropy and Spin Polarization of Auger Electrons .....	717
5.14	Decay of Vacancies in Endohedral Atoms .....	722
	References .....	724
<b>6</b>	<b>Vacancies Decay: Results of Calculations .....</b>	<b>729</b>
6.1	Data Presentation and Used Formulas .....	729
6.2	Description of Figures .....	730
6.3	Description of Tables .....	740
	References .....	758
<b>7</b>	<b>Off-shell Photoionization Cross-sections: Results of Calculations .....</b>	<b>761</b>
7.1	Data Presentation .....	761
7.2	Description of Figures .....	762
	References .....	789
<b>8</b>	<b>Conclusion and Perspectives .....</b>	<b>791</b>
	References .....	794
	<b>Index .....</b>	<b>795</b>

<http://www.springer.com/978-3-642-24751-4>

Handbook of Theoretical Atomic Physics  
Data for Photon Absorption, Electron Scattering, and  
Vacancies Decay

Amusia, M.Y.; Chernysheva, L.V.; Yarzhemsky, V.  
2012, XIII, 799 p. 1031 illus., 836 illus. in color. With  
online files/update., Hardcover  
ISBN: 978-3-642-24751-4