Table of Content

Table of Content	i
Abstract	iii
Kurzfassung	v
Extended Abstract	vi
Symbols and Abbreviations	xxiv
List of Figures	xxv
List of Tables	xxix
1. Introduction	1
2. Literature Review	3
2. 1. The Theory of Luminescence	3
2.1.1. Radiative Transition	6
2.1.2. Down-conversion Luminescence	7
2.1.3. Up-conversion Luminescence	8
2.1.4. Non-radiative Transitions	9
2.2. Application Areas of Phosphors	10
2.2.1. Compact Fluorescence Lamps	10
2.2.2. Solid State Lighting	11
2.2.3. Phosphors for Displays	11
2.2.4. Multimodal Bioimaging	11
2.2.5. Biodetection	11
2.2.6. Security Inks	11
2.3. Host and Dopant Materials for Down and Up-conversion Luminescence	12
2.3.1. Host Materials	12
2.3.2. Yttrium Oxide (Y_2O_3) Based Phosphors	13
2.3.3. Luminescent Ions	14
2.3.4. Rare Earth Ions Luminescence	14
2.3.5. Down Converting Luminescence Mechanism of Y_2O_3: Eu^{3+}	17
2.3.6. Up converting Luminescence Mechanism of Y_2O_3:Yb^{3+}: Er^{3+}	18
2.4. Synthesis Methods of Luminescence Nanostructure Materials	19
2.4.1. Solid State Reaction	19
2.4.2. Solution Combustion	19
2.4.3. Hydrothermal Synthesis	20
2.4.4. Sol-gel	21
2.4.5. Ultrasonic Spray Pyrolysis (USP)	21
2.4.6. Nanoparticle Formation Mechanism by USP	22
2.4.7. Thermal Decomposition of Nitrate Salts	26

Bibliografische Informationen
http://d-nb.info/1211259641

digitalisiert durch DEUTSCHE NATIONAL BIBLIOTHEK

2.4.8. Utilization of USP for Phosphor Synthesis: The-State-of-the-Art 27
2.5. Enhancement of Luminescence 29
2.5.1. Host Lattice Manipulation 29
2.5.2. Energy Transfer Manipulation 30
2.5.3. Surface Passivation 31
2.5.4. Broadband Sensitization 32
2.5.5. Plasmon Enhancement 32
2.5.6. Previous Studies Utilizing Surface Plasmons to Enhance Luminescence 34
2.6. Selection of the Hypothesis and Novelty Behind the Study 36
3. Experimental Procedure 38
3.1. Synthesis 38
3.2. Characterization 41
4. Results and Discussion 43
4.1. DC Y_2O_3:Eu^{3+}@ Ag Hierarchical Nanostructures 43
4.1.1. Assessment of Ag Amount on the Particle Morphology 44
4.1.3. Elucidating the Effect of Ag on Crystal Structure 54
4.1.4. The Effect of Ag on the Photoluminescence Behavior of As-prepared Samples 55
4.1.5. The Effect of Heat Treatment on Particle Crystallinity and Morphology 57
4.1.6. The Effect of Ag on the Photoluminescence Behavior of Heat Treated Samples 64
4.1.7. The Effect of Eu Doping Ratio and Extended Heat Treatment on Microstructure 66
4.1.8. The Effect of Eu Doping Ratio on the Photoluminescence Behavior 68
4.1.9. CIE Diagrams 72
4.2. Correlation of Mechanical Properties and Photoluminescence 74
4.3. The Formation Mechanism of Nanocomposites *via* One Step USP Followed by Heat Treatment 76
4.4. Synthesis of UC Y_2O_3: Er^{3+},Yb^{3+}: @ Ag Nanostructured Core Hierarchical Structures *via* USP (8-10) 78
4.4.1. The Effect of Ag and Precursor Concentration on Particle Crystallinity and Morphology in As-prepared and Heat Treated Conditions 79
4.4.2. The Effect of Ag, Precursor Concentration on the Photoluminescence in the As-prepared and Heat Treated Conditions 86
4.4.3. The Formation Mechanism of Ag @ $Y_{1.97}Yb_{0.02}Er_{0.01}O_3$ Nanocomposites via USP Followed by Heat Treatment 92
5. Conclusion and Assessment of the Hypothesis 95
6. References 97