

TABLE OF CONTENTS

| | | |
|-------|--|----|
| 1 | Preface | 5 |
| 2 | Institute's Profile | 8 |
| 2.1. | Staff..... | 9 |
| 2.2. | Organization chart | 10 |
| 2.3. | Budget..... | 11 |
| 3 | Key Research Topics..... | 12 |
| 3.1. | Long Term Safety of Nuclear Waste Disposal..... | 12 |
| 3.2. | Innovative Nuclear Waste Management Strategies..... | 13 |
| 3.3. | Structure Research..... | 14 |
| 3.4. | Characterisation of Nuclear Waste | 15 |
| 3.5. | Transmutation..... | 16 |
| 3.6. | Nuclear Waste Treatment..... | 17 |
| 3.7. | Nuclear Safeguards..... | 18 |
| 3.8. | Product Quality Control of Radioactive Waste & Packages..... | 20 |
| 3.8.1 | Product Quality Control of Radioactive Waste – High Level Waste from Reprocessing | 21 |
| 3.8.2 | Product Quality Control of Low and Intermediate Level Radioactive Waste (LAW/MAW)..... | 22 |
| 4 | Facilities | 23 |
| 4.1. | Electron Microscopy | 23 |
| 4.2. | Raman spectroscopy | 25 |
| 4.3. | X-ray diffraction analysis..... | 26 |
| 4.4. | Hot Cell Facility, GHZ | 27 |
| 4.5. | Non-destructive assay testing..... | 28 |
| 4.6. | Radiochemical analytics | 29 |
| 4.7. | Miscellaneous..... | 29 |
| 5 | Scientific and Technical Reports 2009/2010 | 30 |
| 5.1. | Radionuclide release from research reactor fuel..... | 30 |
| 5.2. | Separation and enrichment of secondary phases of research reactor fuel elements and identification by SEM-EDX..... | 35 |
| 5.3. | XRD-analysis of secondary phases formed under final repository conditions due to corrosion of UAl_x -Al research reactor fuel elements | 39 |
| 5.4. | Minor actinide(III) recovery from high active waste solutions using innovative partitioning processes..... | 48 |

| | | |
|-------|---|-----|
| 5.5. | 1-cycle SANEX process development studies and lab-scale demonstrations for the direct recovery of trivalent actinides from PUREX raffinate | 57 |
| 5.6. | Innovative SANEX process for actinide(III) separation from PUREX raffinate using TODGA-based solvents | 67 |
| 5.7. | Synthesis and thermal treatment of uranium-based microspheres through internal gelation..... | 74 |
| 5.8. | Conditioning of Minor Actinides in Monazite-type Ceramics..... | 83 |
| 5.9. | Synthesis and characterization of ZrO ₂ based ceramics for innovative nuclear waste strategies..... | 89 |
| 5.10. | Synthesis and Characterization of Sm _{1-x} Ce _x PO ₄ Ceramics used for Nuclear Waste Management..... | 95 |
| 5.11. | Raman Spectra of Synthetic Rare Earth Orthophosphates | 104 |
| 5.12. | MC simulation of thermal neutron flux of large samples irradiated by 14 MeV neutrons | 112 |
| 5.13. | An Improved Method for the non-destructive Characterization of Radioactive Waste by Gamma Scanning | 120 |
| 5.14. | Reconstruction of the Activity of Point Sources for the Accurate Characterization of Nuclear Waste Drums by Segmented Gamma Scanning..... | 129 |
| 5.15. | Prompt Gamma Characterization of Actinides | 135 |
| 5.16. | Treatment and disposal of irradiated graphite and other carbonaceous waste..... | 139 |
| 5.17. | Advanced Gas-cooled Accelerator-driven Transmutation Experiment – AGATE... | 149 |
| 5.18. | Monitoring Uranium Mining and Processing Sites: Some Findings from an Airborne Hyperspectral Survey of Uranium Mining Legacies under Rehabilitation | 155 |
| 5.19. | Multiresolution segmentation adapted for object-based change detection | 163 |
| 5.20. | Nuclear Safeguards and Non-proliferation Issues in GMES..... | 171 |
| 5.21. | Use of TerraSAR-X Imagery for Geological Repositories Monitoring | 175 |
| 5.22. | The NPT Review Conference 2010: Perspectives for International Safeguards.... | 183 |
| 5.23. | 2009-2010 annual report of PKS-WAA | 191 |
| 5.24. | Development and Application of a Beowulf Cluster for Nuclear Simulation | 192 |
| 5.25. | 2009-2010 annual report of PKS-I | 199 |
| 5.26. | Product control of waste products with new coating materials | 200 |
| 5.27. | Challenges in Compliance with the Waste Acceptance Requirements for the KONRAD Mine | 203 |
| 6 | Education and training activities | 207 |
| 6.1. | Courses taught at universities by IEK-6 staff..... | 208 |
| 6.2. | Graduates..... | 209 |
| 6.2.1 | Diploma/Master Thesis..... | 209 |

| | | |
|--------|--|-----|
| 6.2.2 | Doctoral Thesis | 209 |
| 6.3. | Vocational training | 210 |
| 6.4. | Further education and information events | 210 |
| 6.5. | Institute Seminar | 212 |
| 6.5.1 | Internal talks 2009 | 212 |
| 6.5.2 | Internal talks 2010 | 213 |
| 6.5.3 | Invited talks 2009 | 214 |
| 6.5.4 | Invited talks 2010 | 215 |
| 6.6. | Visiting Scientists | 216 |
| 7 | Awards | 217 |
| 8 | Selected R&D projects | 218 |
| 8.1. | EU projects | 218 |
| 8.2. | More projects | 218 |
| 9 | Committee work | 219 |
| 10 | Patents | 220 |
| 11 | Publications | 221 |
| 11.1. | Highlights | 221 |
| 11.2. | Publications 2009 | 224 |
| 11.2.1 | Journal papers | 224 |
| 11.2.2 | Proceedings/Books | 225 |
| 11.2.3 | Internal reports | 226 |
| 11.2.4 | Poster | 227 |
| 11.2.5 | Presentations | 228 |
| 11.3. | Publications 2010 | 230 |
| 11.3.1 | Journal papers | 230 |
| 11.3.2 | Proceedings/Books | 230 |
| 11.3.3 | Internal reports | 232 |
| 11.3.4 | Poster | 234 |
| 11.3.5 | Presentations | 235 |
| 12 | How to reach us | 238 |