

## **Dr. Krishna K. Pandey**

**Institution:** Institute of Wood Science and Technology, Bengaluru, India

**Date of birth:** 7<sup>th</sup> May, 1962

### **Communication Address:**

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### **Education:**

- Ph. D. (Physics) 1990, Kumaon University Nainital, India
- M. Sc. (Physics) 1983, Kumaon University Nainital, India

### **Research Interests:**

- Photo-degradation, weathering and protection of wood
- Wood coatings
- Wood modification (chemical and thermal modification) and preservation
- Transparent wood
- Surface properties and characterization of wood polymers by spectroscopic techniques
- Wood Energy

### **Awards / Honors / Fellowships / Visiting positions:**

- Member of UNEP - Environmental Effects Assessment Panel (2015 onwards)
- Elected Fellow of International Academy of Wood Science (2013)
- National Awards for Excellence in Forestry Research by Indian Council of Forestry Research and Education (2012)
- Senior Researcher, Helsinki University of Technology, Finland (Sept. 2006 to Dec. 2007)
- Postdoctoral Researcher, Kyoto Institute of Technology, Japan (Jan 1993 to March 1994)
- FAO Fellow, Forest Product Research Centre, Buckinghamshire Chilterns University College, U.K. (September – December 1999)
- Ron Cockcroft Award (RCA) of International Research Group on Wood Protection (IRG) (2004)
- Guest Speaker of Institute of Wood Biology and Technology, Gottingen University, Germany (December 12-23, 2005).
- Invited speaker at Wood Laboratory, EMPA, Dübendorf, Switzerland 19-22 November 2007).

- DST Young Scientist (SERCYS) (1990-1992).
- UGC and CSIR Senior Research Fellow, Kumaun Univ. Nainital, India (1986-1990).
- UGC Junior Research Fellow, Kumaun Univ. Nainital , India (1984-1986).
- Reviewer for several International Journals including: Polymer Degradation and Stability, Holzforschung, Wood Science and Technology, International Biodeterioration & Biodegradation, Bioresources, J. Wood Chemistry and Technology, J. Wood Science, J. Material Science, J. Photochemistry and Photobiology, European Journal of Wood and Wood Products, Coloration Technology, J. Applied Surface Science, Advances in Material Science and Engineering, Progress in Organic Coatings, Vibrational Spectroscopy, International Journal of Biological Macromolecules

**Publications:**

- 01 Edited book (publisher-Springer)
- 67 Papers published in peer reviewed journals
- 14 Papers published in Book / Proceedings of Conferences
- 12 Project Completion Reports/ Technical reports
- 05 UNEP reports
- Citation index of all published papers 3650, h-index – 23 (Google scholar)

## List of Publications

### A. Book:

**Title of book:** Wood is Good: Current Trends and Future Prospects in Wood Utilization.

**Editors:** K.K. Pandey, V. Ramakantha, S.S. Chauhan, A.N. Arunkumar

**Publisher** - Springer Verlag, Singapore, 2017, ISBN 978-981-10-3115-7.

### B. Papers Published in peer reviewed journals:

1. A.S. Rao, Giridhar B.N., S. Nair, A. Chathoth, **K.K. Pandey** (2019) Flexible transparent wood prepared from poplar veneer and polyvinyl alcohol, **Composites Science and Technology**, 182, Article No. 10779.
2. P.W. Barnes, C.E. Williamson, R.M. Lucas, S.A. Robinson, S. Madronich, N.D. Paul, J.F. Bornman, A.F. Bais, B. Sulzberger, S.R. Wilson, A.L. Andrady, R.L. McKenzie, P.J. Neale, A.T. Austin, G.H. Bernhard, K.R. Solomon, R.E. Neale, P.J. Young, M.N., L.E. Rhodes, S. Hylander, K.C. Rose, J. Longstreth, P.J. Aucamp, C.L. Ballaré, R.M. Cory, S.D. Flint, FR. de Gruijl, D.-P. Häder, A.M. Heikkilä, M.A.K. Jansen, **K.K. Pandey**, T. M. Robson, C.A. Sinclair, S. Wängberg, R.C. Worrest, S. Yazar, A.R. Young and R.G. Zepp (2019). Ozone depletion, ultraviolet radiation, climate change and prospects for a sustainable future, **Nature Sustainability**, 2, 569-579.
3. A.L. Andrady, **K.K. Pandey**, A.M. Heikkilä (2019) Interactive effects of solar UV radiation and climate change on material damage, **Photochemical & Photobiological Sciences** 18, 804-825.
4. S. Shukla, **K.K. Pandey**, Kishan Kumar V.S. (2019) Chemical and application properties of some solvent and water based coatings on wooden substrate, **DRVNA INDUSTRIJA** 70 (2) 107-114.
5. S. Nair, Giridhar B.N, **K.K. Pandey** (2018) UV stabilization of wood by nano metal oxides dispersed in propylene glycol. *J. Photochemistry & Photobiology, B: Biology, Journal of Photochemistry & Photobiology, B: Biology* 183, 1–10.
6. A. F. Bais, R. M. Lucas, J. F. Bornman, C. E. Williamson, B. Sulzberger, A. T. Austin, S. R. Wilson, A. L. Andrady, G. Bernhard, R. L. McKenzie, P. J. Aucamp, S. Madronich, R. E. Neale, S. Yazar, A. R. Young, F. R. de Gruijl, M. Norval, Y. Takizawa, P. W. Barnes, T. M. Robson, S. A. Robinson, C. L. Ballaré, S. D. Flint v, P. J. Neale, S. Hylander, K. C. Rose, S.-Å. Wängberg, D.-P. Häder, R. C. Worrest, R. G. Zepp, N. D. Paul, R. M. Cory, K. R. Solomon, J. Longstreth, **K. K. Pandey**, H. H. Redhw, A. Torikai and A. M. Heikkilä., (2018). Environmental effects of ozone depletion, UV radiation and interactions with climate change: UNEP Environmental Effects Assessment Panel, update 2017. *Photochemical & Photobiological Sciences*, 17(2), pp.127-179.
7. S. Nair, **K.K. Pandey**, Giridhar B.N., G. Vijayalakshmi (2017) Decay resistance of Rubberwood (*Hevea brasiliensis*) impregnated with ZnO and CuO nanoparticles dispersed in propylene glycol, **International Biodeterioration & Biodegradation** 122, 100-106.
8. S.S. Bisht, **K.K. Pandey**, G. Joshi, S. Naithani (2017). New Route for Carboxymethylation of Cellulose: Synthesis, Structural Analysis and Properties. *Cellulose Chemistry and Technology* 51 (7-8), 609-619.
9. A. Andrady, P.J. Aucamp, A.T. Austin, A.F. Bais, C.L. Ballaré, P.W. Barnes, G.H. Bernhard, L.O. Björn, J.F. Bornman, N. Congdon, R.M. Cory, S.D. Flint, F.R. Gruijl, D.-P. Häder, A. Heikkilä, S. Hylander, J. Longstreth, R.M. Lucas, S. Madronich, R.L. McKenzie, P. Neale, R. Neale, M. Norval, **K.K. Pandey**, N. Paul, M. Rautio, H. Redhwi, S.A. Robinson, K.C. Rose, K.R. Solomon, B. Sulzberger, C.E. Williamson, S.R. Wilson, S. Wängberg, R.C. Worrest, A.R. Young, R.G. Zepp (2017) United Nations Environment Programme, Environmental Effects Assessment Panel. Environmental effects of ozone depletion and its interactions with climate change: Progress report, 2016. **Photochemical & Photobiological Sciences** 16, 107-145.

10. B.N. Giridhar, **K.K. Pandey**, B.E. Prasad, S.S. Bisht, H.M. Vagdevi (2017) Dimensional stabilization of wood by chemical modification using isopropenyl acetate, **Maderas. Ciencia y tecnología** 19, 15 - 20.
11. V. Živković, M. Arnold, **K.K. Pandey**, K. Richter, H. Turkulin (2016) Spectral sensitivity in the photodegradation of fir wood (*Abies alba* Mill.) surfaces: correspondence of physical and chemical changes in natural weathering, **Wood Science and Technology** 50, 989–1002.
12. B.N. Giridhar, **K.K. Pandey**, A.S. Shinde, H.M. Vagdevi (2016) N-Bromosuccinimide (NBS) - an efficient catalyst for acetylation of wood. **Holzforschung** 70, 421–427.
13. B.N. Giridhar, **K.K. Pandey** (2016) UV resistance and dimensional stability of wood modified with isopropenyl acetate. **J. Photochemistry & Photobiology B: Biology** 155, 20-27.
14. **K.K. Pandey**, S.V. Kumar, K. Srinivas (2016) Inhibition of leaching of water soluble extractives of *Pterocarpus marsupium* by heat treatment. **European Journal of Wood and Wood Products** 74, 223-229.
15. B.E. Prasad, **K.K. Pandey**, B.N. Giridhar (2016) A note on effect of microwave heating on iodine catalyzed acetylation of wood. **J. Wood Chemistry and Technology** 36, 205-210.
16. A. Andrady, P.J. Aucamp, A.T. Austin, A. F. Bais, C.L. Ballaré, P.W. Barnes, G.H. Bernhard, L.O. Björn, J.F. Bornman, D.J. Erickson, F.R. de Gruijl, D.-P. Häder, M. Ilyas, J. Longstreth, R.M. Lucas, S. Madronich, R.L. McKenzie, R. Neale, M. Norval, **K.K. Pandey**, N. Paul, H.H. Redhwi, S.A. Robinson, K. Rose, M. Shao, R.P. Sinha, K.R. Solomon, B. Sulzberger, Y. Takizawa, A. Torikai, K. Tourpali, C.E. Williamson, S.R. Wilson, S. Wängberg, R.C. Worrest, A. Young, and R.G. Zepp (2016) United Nations Environment Programme, Environmental Effects Assessment Panel. Environmental effects of ozone depletion and its interactions with climate change: Progress report, 2015, **Photochemical & Photobiological Sciences** 15, 141-174.
17. **K.K. Pandey**, K. Srinivas (2015) Performance of polyurethane coatings on acetylated and benzoylated rubberwood. **European Journal of Wood and Wood Products** 73, 111-120.
18. A.L. Andrady, A. Torikai, H.H. Redhwi, **K.K. Pandey**, P. Gies (2015) Consequences of stratospheric ozone depletion and climate change on the use of materials. **Photochemical & Photobiological Sciences** 14, 170 - 184.
19. A.L. Andrady, P.J. Aucamp, A. Austin, A.F. Bais, C.L. Ballaré, P.W. Barnes, G.H. Bernhard, J.F. Bornman, M.M. Caldwell, F.R. deGruijl, D.J. Erickson, S.D. Flint, K. Gao, P. Gies, D.-P. Häder, M. Ilyas, J. Longstreth, R. Lucas, S. Madronich, R.L. McKenzie, R. Neale, M. Norval, **K.K. Pandey**, N.D. Paul, M. Rautio, H.H. Redhwi, S.A. Robinson, K. Rose, M. Shao, R.P. Sinha, K.R. Solomon, B. Sulzberger, Y. Takizawa, X. Tang, A. Torikai, K. Tourpali, J.C. van der Leun, S.-Å. Wängberg, C.E. Williamson, S.R. Wilson, R.C. Worrest, A.R. Young, R.G. Zepp. (2015): Environmental effects of ozone depletion and its interactions with climate change: 2014 assessment executive summary, **Photochemical & Photobiological Sciences** 14, 14-18.
20. K. Srinivas, **K. K. Pandey** (2012) Photodegradation of thermally modified Wood. **J. Photochemistry & Photobiology B: Biology** 117, 140-145.
21. B.E. Prasad, **K.K. Pandey** (2012) Solvent-free chemical modification of wood by acetic and butyric anhydride with iodine as catalyst. **Holzforschung** 66, 967–971.
22. K. Srinivas, **K.K. Pandey** (2012) Effect of Heat Treatment on Color Changes, Dimensional Stability, and Mechanical Properties of Wood, **J. Wood Chemistry and Technology** 32, 304-316.
23. J. Salla, **K.K. Pandey**, K. Srinivas (2012) Improvement of UV resistance of wood surfaces by using zinc oxide nanoparticles. **Polymer Degradation and Stability** 97, 592-596.
24. B.E. Prasad, **K.K. Pandey** (2012) Microwave drying of bamboo. **European Journal of Wood and Wood Products** 70, 353-355.

25. Jayashree Salla, **K.K. Pandey**, G.K. Prakash, K.M. Mahadevan (2012) Photobleaching and dimensional stability of rubberwood esterified by fatty acid chlorides. **J. Wood Chemistry and Technology** 32, 121-136.
26. Jayashree, **K.K. Pandey**, H.C. Nagaveni, K.M. Mahadevan (2011) Fungal resistance of rubber wood modified by fatty acid chlorides. **International Biodeterioration & Biodegradation** 65, 890-895.
27. R. Kumar, **K.K. Pandey**, N. Chandrashakar, S. Mohan. (2011) Study of age and height wise variability on calorific value and other fuel properties of Eucalyptus hybrid, *Acacia auriculaeformis* and *Casuarina equisetifolia*. **Biomass and Bioenergy** 35, 1339-1344.
28. **K.K. Pandey**, M Hughes, T. Vuorinen (2010) Dimensional stability, UV resistance, and static mechanical properties of Scots pine chemically modified with alkylene epoxides. **BioResources** 5, 598-615.
29. **K.K. Pandey**. (2010). Weathering and surface protection of wood. **Wood News** 20, 8-14.
30. R. Kumar, N. Chandrashakar, **K.K. Pandey**, S. Mohan (2010) Effect of tree-age on calorific value and other fuel properties of Eucalyptus hybrid. **J. Forestry Research** 21, 514-516.
31. **K.K. Pandey**, Jayashree, H.C. Nagaveni (2009) study of dimensional stability, decay resistance and light stability of phenylisothiocyanate modified rubberwood. **BioResources** 4, 257-267.
32. R. Kumar, N. Chandrashakar **K.K. Pandey** (2009) Study on fuel properties and combustion characteristic of *Lantana camara* and Eupatorium spp. **Current Science** 97, 930-935.
33. R. Kumar, **K.K. Pandey**, N. Chandrashekar (2008) Effect of carbonization conditions on yield and chemical composition of wood char prepared from selected fast growing fuelwood species. **J. Indian Academy of Wood Science** 5, 90-100.
34. **K.K. Pandey**, T. Vuorinen (2008) Comparative study of photodegradation of wood by a UV laser and Xenon light source. **Polymer Degradation and Stability** 93, 2138-2146.
35. **K.K. Pandey**, T. Vuorinen (2008) UV resonance Raman spectroscopic study of photodegradation of hardwood and softwood lignins by UV laser. **Holzforschung** 62, 169-175.
36. **K.K. Pandey**, T. Vuorinen (2008) Study of kinetics of reaction of lignin model compounds with propylene oxide. **Holzforschung** 62, 183-188.
37. **K.K. Pandey**, H.C. Nagaveni (2007) Rapid characterization of brown and white rot degraded chir pine and rubberwood by FTIR. **Holz als Roh- und Werkstoff** 65, 477-481.
38. G.K. Prakash, **K.K. Pandey**, R.K.D. Ram, K.M. Mahadevan (2006) Dimensional stability and photostability of octanoylated Wood. **Holzforschung** 60, 539-542.
39. **K.K. Pandey**, N. Chandrashekar (2006) Photostability of Wood Surfaces Esterified by Benzoyl Chloride. **J. Applied Polymer Science** 99, 2367-2374.
40. **K.K. Pandey**, N.K. Upreti (2005). Role of pretreatments in protection of wood surface and finishes in weathering of *Pterocarpus marsupium* wood. **Journal of Tropical Forest Science** 17, 141-150.
41. **K.K. Pandey** (2005) Study of effect of photo-irradiation on surface chemistry of wood. **Polymer Degradation and Stability** 90, 9-20.
42. **K.K. Pandey** (2005) A note on the influence of extractives on the photo-discolouration and photo-degradation of wood. **Polymer Degradation and Stability** 87, 375-379.
43. U. Tripathy, P. B. Bisht, **K.K. Pandey** (2005) Excitation energy transfer efficiency of dipole-dipole interaction in a dye pair in polymer medium. **Research on Chemical Intermediates** 31, 649-659.
44. U. Tripathy, P.B. Bisht, **K. K. Pandey** (2004) Study of excitation energy migration and transfer in

- DMOCI-RB in thin films of polyvinyl alcohol. **Chemical Physics** 299, 105-112.
45. **K.K. Pandey**, A.J. Pitman. (2004) Examination of Lignin Content in a Softwood and Hardwood Decayed by a Brown-Rot Fungus Using the Acetyl Bromide Method and FTIR Spectroscopy. **J. Polymer Science: Part A: Polymer Chemistry** 42, 2340-2346.
  46. P. Oevering, A.J. Pitman, **K.K. Pandey**. (2003). Wood digestion in *Pselactus spadix* Herbst - a weevil attacking marine timber structures. **Biofouling** 19, 249S-254S.
  47. **K.K. Pandey**, A.J. Pitman (2003) FTIR studies of the changes in wood chemistry following decay by brown-rot and white-rot fungi. **International Biodeterioration and Biodegradation** 52, 151-160.
  48. A Samani, **K.K. Pandey**, K.S. Reddy (2003) Economics of Biomass Energy Conversion Systems. **Wood News** 13, 22-23.
  49. **K.K. Pandey**, A.J. Pitman (2002) Weathering characteristics of modified rubberwood (*Hevea brasiliensis*). **J. Applied Polymer Science** 85, 622-631.
  50. S.S Chauhan, A. Karmarkar, P.K. Aggarwal, **K.K. Pandey** (2001) Moisture adsorption behaviour of esterified rubber wood. **Holz als Roh-und Werkstoff** 59, 250-253.
  51. N.K. Upreti, **K.K. Pandey**, A.K. Ananthanarayana (1999) Prevention of extractive leaching by chemical treatments in *Pterocarpus marsupium*. **Holzforchung** 53, 675-676.
  52. **K.K. Pandey** (1999) A Study of chemical structure of soft and hardwood and wood polymers by FTIR spectroscopy. **J. Applied Polymer Science** 71, 1969-1975.
  53. **K.K. Pandey**, S.S. Chauhan, P.K. Aggarwal. (1998) Reaction of wood with inorganic salts. **Holz als Roh-und Werkstoff** 56, 412-415.
  54. **K.K. Pandey**, D.P. Khali. (1998) Accelerated weathering of wood modified by chromium trioxide. **Holzforchung** 52, 467-471.
  55. **K.K. Pandey**, N. K. Upreti, V.V. Srinivasan (1998) A Fluorescence spectroscopic study on wood. **Wood Science and Technology** 32, 309-315.
  56. **K.K. Pandey**, K.S Theagarajan (1997) Analysis of wood surfaces and ground wood by diffuse reflectance (DRIFT) and photoacoustic (PAS) Fourier transform infrared spectroscopic techniques. **Holz Roh-und Werkstoff** 55, 383-390.
  57. **K.K. Pandey**, S. Hirayama (1996) Enhanced excitation energy transfer in microdroplets - a study by time resolved microscopy. **J. Photochemistry and Photobiology A: Chemistry** 99, 165-175.
  58. **K.K. Pandey**, M. Okamoto, S. Hirayama (1994) A bell-shape dependence on solvent viscosity of fluorescence quenching of 9,10-dicyanoanthracene by oxygen in solution. **Chemical Physics Letters** 224, 417-423.
  59. **K.K. Pandey** (1992) Electronic excitation transport, diffusion and trapping. **Chemical Physics** 165, 123-134.
  60. **K.K. Pandey** (1991)  $\text{UO}_2^{2+} \rightarrow \text{Sm}^{3+}$  and  $\text{UO}_2^{2+} \rightarrow \text{Pr}^{3+}$ , energy transfer in sodium borate glass: **Indian J. Pure & Applied Physics** 29, 362-367.
  61. **K.K. Pandey**, T.C. Pant. (1991) Migration Modulated donor-acceptor energy transfer in PMMA. **Journal of Luminescence** 47, 319-325.
  62. **K.K. Pandey**, T.C. Pant. (1991) Solar energy concentrator based on uranyl-doped PMMA. **Solar Energy Materials** 21, 327-334.
  63. **K.K. Pandey**, T.C. Pant (1990) Diffusion-modulated energy transfer. **Chemical Physics Letters** 170, 244-252.

64. **K.K. Pandey**, H.C. Joshi and T.C. Pant (1989) Influence of donor-donor transport on excitation energy transfer. **PRAMANA - Journal of Physics** 32, 63-72.
65. **K.K. Pandey**, H.C. Joshi, T.C. Pant (1988) Migration effects on excitation energy transfer by decay analysis using a nanosecond fluorimeter. **Chemical Physics Letters** 148, 472-478.
66. **K.K. Pandey**, H.C. Joshi and T.C. Pant (1988) Excitation energy migration and transfer in a dye pair in PMMA. **Journal of Luminescence** 42, 197-203.
67. H.C. Joshi, **K. K. Pandey**, K.K. Pant, G.C. Joshi, T.C. Pant. (1986) Energy transfer from acriflavine to rhodamine B in cellulose acetate. **Indian J. Pure & Applied Physics** 24, 513-514.

### C. Papers Published in Books/Proceedings of Symposiums/Conferences:

1. S. Shukla, **K.K. Pandey**, Giridhar B.N., Kishan Kumar V.S. (2018). UV blocking efficiency of organic solvent borne and water borne polyurethane wood coatings with nano ZnO dispersion. In: Proceedings of the International Conference on Agriculture and Allied Sciences: The productivity, Food security and Ecology. Eds SK Acharyan D Basu, MM Adhikary, GC Mishra, Krishi Sanskriti Publications (ISBN: 978-93-85822-71-1), pp 55-60.
2. **KK Pandey** (2018) Chemical modification of wood. Proceedings of Institute Industry Integration held on 19<sup>th</sup> January 2018 at IWST Bangalore
3. K. Srinivas and **K.K. Pandey** (2017) Enhancing Photostability of Wood Coatings Using TitaniumDioxide Nanoparticles. In: "Wood is Good: Current Trends and Future Prospects in Wood Utilization". Eds K.K. Pandey, V. Ramakantha, S.S. Chauhan, A.N. Arunkumar, Springer Verlag, Singapore, pp 251-259.
4. K. Ghadge and **K.K. Pandey** (2017) Effect of Thermal Modification on Physical Properties of Bambusa nutans. In: "Wood is Good: Current Trends and Future Prospects in Wood Utilization". Eds K.K. Pandey, V. Ramakantha, S.S. Chauhan, A.N. Arunkumar, Springer Verlag, Singapore, pp 287-295.
5. Giridhar B. N., K. K. Pandey (2016) Accelerated weathering and fungal resistance of wood modified with isopropenyl acetate, International Research Group on Wood protection. Document No. IRG/WP 16-40764, Stockholm, Sweden.
6. **K K Pandey** and K Srinivasa (2013) Study of UV resistance and natural weathering of coatings on chemically modified wood, International Research Group on Wood protection. Document No. IRG/WP 13-40629, Stockholm, Sweden.
7. V. Živković, M. Arnold, **K.K. Pandey**, K. Richter, Hrvoje Turkulin (2013) Novel approach in analysis of light source effects to spectral sensitivity of fir wood surfaces. *Proceedings of 6<sup>th</sup> European Weathering Symposium EWS, Bratislava* on September 11 - 13, 2013.
8. **K. K. Pandey** and T. Vuorinen. Kinetic studies on etherification of some lignin model compounds, *Proceedings of 3<sup>rd</sup> European Conference on Wood Modification 2007, Cardiff*, 57-64.
9. **K. K Pandey**: Photodegradation of unmodified and chemically modified wood surfaces. Proceedings of 3rd International Symposium on Surfacing and Finishing of wood, Kyoto, Japan, (2004) 75-86.
10. **K. K. Pandey**: Correlation between changes in colour and chemical composition during photo-degradation of wood surfaces. International Research Group on Wood protection. Document No. IRG/WP 05-40301, Stockholm, Sweden.
11. **K. K. Pandey**: Photo-discoloration and Degradation of Wood and its Stabilisation by Modification with Benzoyl Chloride. International Research Group on Wood preservation. (2004) Document No. IRG/WP 04-40274, Stockholm, Sweden.

12. **K. K. Pandey:** Natural and accelerated weathering of Rubber wood. Proceedings of Symposium on Advances in Polymeric Building materials POLY BUILT, Roorkee (2003) 130- 136.
13. S. S Chauhan, A. Karmarkar and **K.K. Pandey:** Dimensional stabilisation of wood by chemical modification. Proceedings of IPIRTI Conference, (1998) 164-168.
14. **K. K. Pandey,** M. Okamoto and S. Hirayama: A study of diffusion effects on oxygen quenching of 9,10-dicyanoanthracene in solution. Proceedings of Symposium on Photochemistry, Hokkaido University, Sapporo, Japan, 1993, 469-470.
15. R. Kumar, **K.K. Pandey** and N. Chandrashekar: Fuel characteristic of *Dendrocalamus brandissi* Kurz., *Dendrocalamus strictus* (Roxb.) Nees. and *Bambusa bambos* (L.) Voss. Proceedings of the National conference on Bamboo: Management, Conservation, Value addition and Promotion. Page no 263-267.

#### **D. Project completion report / technical manual / final technical report**

1. Final technical report of CSIR, New Delhi funded project “Weathering of Wood Surfaces”. Report submitted to CSIR in 2005.
2. Final technical report of IFS, Sweden funded project “Characterization and quantitative analysis of decayed wood by fluorescence and Fourier transform infrared (FTIR) spectroscopy”. Report submitted to International Foundation for Science, Sweden in 2006.
3. Final technical report of CSIR, New Delhi funded project “Improvement of weathering properties of wood surfaces by chemical modification”. Report submitted to CSIR in 2012.
4. Final technical report of NBM, New Delhi funded Sub project “Seasoning and Preservation of Bamboo”. Report submitted to NBM in 2011
5. Final Technical Report of Mangrove project (Investigations on lesser known aspects of mangrove biodiversity and ecology in the states of Goa, Karnataka and Andhra Pradesh) submitted to MOEF (As CO-PI). Report submitted to MOEF in 2009.
6. Research Report on Collaborative Research work on “Aging Phenomenon of Wood and their Prevention” carried out at Department of Forest Product Technology, Helsinki University of Technology, Finland, and Submitted to the ICFRE Dehradun in January 2008.
7. Final technical report of ICFRE funded project “Performance of Coatings on Modified Wood Surfaces” submitted to ICFRE Dehra dun in 2012.
8. Final technical report of ICFRE funded project “Studies on chemical modification of wood and its thermoplasticization” submitted to ICFRE Dehra dun in 2012.
9. Final technical report of ICFRE funded project “Nanoparticles based wood coatings for outdoor applications” submitted to ICFRE Dehra dun in 2015.
10. Final technical report of CSIR, New Delhi funded project “New methods of chemical modification of wood for improving dimensional stability and durability”. Report submitted to CSIR in 2016.
11. Final technical report of DST, New Delhi funded project “Microwave assisted chemical modification of wood”. Report submitted to DST in 2016.
12. Final technical report of ICFRE funded project “Wood modification of *Melia composite* for improving its dimensional stability and durability” submitted to ICFRE Dehra dun in 2017.



#### **E. UNEP Reports:**

Co-authored following UNEP reports submitted to UNEP for circulation to parties to Montreal protocol.

1. Environmental Effects and Interactions of Stratospheric Ozone Depletion, UV Radiation, and Climate Change: 2018 Assessment Report
2. Environmental Effects Assessment Panel Update Report, 2017
3. Environmental Effects of Ozone Depletion and its Interactions with Climate Change: Progress Report, 2016
4. Environmental Effects of Ozone Depletion and its Interactions with Climate Change: Progress Report, 2015
5. Environmental Effects of Ozone Depletion and its interactions with Climate Change: 2014 Assessment