Prem Pal

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Objective

Development of innovative processes and techniques for MEMS/NEMS design, fabrication and characterization.

Research Interests

MEMS/Microelectronics technology, MEMS based bio/chemical and mechanical sensors, Thin films for MEMS

Education

- ***Indian Institute of Technology Delhi***

Ph.D	in MEMS	December 2004
Thesis title :	Some Novel Processes and Techniques for MEMS Design, Fabrication and Characterization.	
M.Tech	in Solid State Materials	December 1999
Dissertation :	Fabrication and Characterization of MOS Capacitor for High Performance Silicon Devices and ICs.	

- ***Agra University Agra***

Master of Science (M. Sc) in Physics	December 1995
Bachelor of Science (B. Sc)	December 1993

Experience

- Six months training during the year 1999 at Solid State Physics Laboratory (SSPL) New Delhi on silicon device processing.
- Design and development of microstructures for MEMS
- Direct wafer bonding and its characterization by Infrared Thermography

Job Experience

- Postdoctoral Fellow (27th December 2004 ~ 10th June 2005) Indian Institute of Technology Delhi, India
- Postdoctoral Researcher (1st July 2005 ~) Yonsei University Seoul, South Korea

Microelectronics and MEMS Processing Skills

Wafer Cleaning, Oxidation, Diffusion, Thin Film Deposition, Photolithography, LOCOS Process, RF/DC Sputtering, Thermal Evaporation, Reactive Ion Etching, Electroless Nickel Plating, Wafer Lapping and Polishing, Wet Isotropic and Anisotropic Etching, Wafer Bonding, Surface and Bulk Micromachining Process, Mask design and fabrication

Computer Skills

- Window- NT and XP • Window-2000 • MSDOS • MS Office • AUTOCAD
- MatLab • Origin

Honors and Awards

1. **"K. Suryanarain Rau Memorial Senior Student Award" for "Research and Development in Smart Technology-2005"** [Award is presented by *Indian Society for Advancement of Materials and Process Engineering* ***(ISAMPE)***]
2. **"FITT Award" for "Best Industry Relevant Ph.D. Project -2005"** [Award is presented by *Foundation for Innovation and Technology Transfer* ***(FITT),*** *Indian Institute of Technology Delhi, India*]

Patents and Publications

Patents filed

1. Microelectromechanical device with recessed micromechanical structure, and fabrication method thereof (*Indian patent application no. 39/DEL/2003*).
2. Fabrication Method of Microstructures with Perfect Convex Corners (*Indian patent application no. 508/DEL/2004*).

International Journals

1. **Prem Pal**, Yong-Jun Kim, and Sudhir Chandra, "Front-to-Back Alignment Techniques in Microelectronics/MEMS Fabrication: A Review," accepted in *Sensor Letters.*
2. Ravibabu Mulaveesala, **Prem Pal**, and Suneet Tuli, Interface Study of Bonded Wafers by Digitized Linear Frequency Modulated Thermal Wave Imaging," accepted in *Sensors and Actuators A.*
3. **Prem Pal** and Sudhir Chandra, "RF Sputtered Silicon for MEMS," *Journal of Micromechanics and Microengineering*, vol. 15, no.8, pp. 1536-1546, 2005
4. Vivekanand Bhatt, **Prem Pal**, and Sudhir Chandra "Feasibility Study of RF Sputtered ZnO Film for Surface Micromachining," *Surface & Coatings Technology*, vol. 198, pp. 304– 308, 2005.
5. **Prem Pal** and Sudhir Chandra, "Recessed Microstructures with Perfect Convex Corners for Accelerometers," *Sensor Letters*, vol. 2, no. 3-4, pp. 226-231, 2004.
6. **Prem Pal** and Sudhir Chandra, "Bulk-micromachined Structures inside Anisotropically Etched Cavity," *Smart Material and Structures*, vol. 13, no. 6, pp. 1424-1429, 2004.
7. **Prem Pal** and Sudhir Chandra, "A Novel Process of Perfect Convex Corner Realization in Bulk Micromachining," *Journal of Micromechanics and Microengineering*, vol. 14, no.10, pp. 1416-1420, 2004.
8. **Prem Pal,** Suneet Tuli, and Sudhir Chandra, "A New Technique of Front-to-Back Alignment for MEMS," *Sensor Letters*, vol. 2, no.1, pp.78-81, 2004.
9. **Prem Pal,** Suneet Tuli, and Sudhir Chandra, "Design and Fabrication of SiO_2 Micromechanical Structures inside Anisotropically Etched Cavity," *International Journal of Computational Engineering Science,* vol.4, no.3, pp.489-492, 2003.

International Conferences

10. Sudhir Chandra, Vivekanand Bhatt, Ravindra Singh, Preeti Sharma and **Prem Pal,** "RF sputtering process for rapid prototyping of MEMS," *International Conference on MEMS and Semiconductor Nanotechnology*, December 20-22, 2005, IIT Kharagpur, India.
11. **Prem Pal,** Vivekanand Bhatt, and Sudhir Chandra, "RF Sputtered Silicon Nitride for LOCOS Process and MEMS," *2nd International Conference on Technological Advances of Thin Films & Surface Coatings (Thin Film -2004)*, July 13-17, 2004, Singapore.
12. **Prem Pal**, Sudhir Chandra, and Harish Bahadur, "RF Sputtered Silicon Thin Films for MEMS," *2nd International Conference on Technological Advances of Thin Films & Surface Coatings (Thin Film -2004)*, July 13-17, 2004, Singapore.

13. **Prem Pal** and Sudhir Chandra, "Capacitive Pressure Sensor and Accelerometer Design Using Recessed Microstructures," *XII International Workshop on Physics of Semiconductor Devices (IWPSD-2003)*, December 16-20, 2003, pp.721-723.
14. **Prem Pal**, Suneet Tuli, and Sudhir Chandra, "P^+ Silicon Recessed Micromechanical Structures for MEMS Applications," *Symposium on Design, Test, Integration and Packaging of MEMS and MOEMS*, May 5-7, 2003, Mandelieu-La Napoule, France, pp. 378-381. *Devices (IWPSD-2001)*, December 11-15, 2001, pp. 540-543.
15. **Prem Pal**, Prashant Chauhan, Suneet Tuli, Gorang Bose, and Sudhir Chandra "Amplitude measurement of Vibrating Silicon Using Talbot Interferometry," *XI International Workshop on Physics of Semiconductor Devices (IWPSD-2001)*, December 11-15, 2001, pp. 540-543.
16. Sudhir Chandra, Vivekanand Bhatt, **Prem Pal**, Harish Bahadur, K.N.Sood, Ram Kishore, R.P.Pant and S.K.Haldar, "RF Sputtered Materials for MEMS Based Microwave Circuit Components," *Asia Pacific Microwave Conference (APMC-2004)*, December 15-18, 2004, New Delhi, India.
17. Harish Bahadur, R.K.Sharma, Vivekanand Bhatt, **Prem Pal**, and Sudhir Chandra, "Scanning Tunneling Microscope Investigations of Thin Films of ZnO," *International Conference on Smart Materials*, December 1-3, 2004, Chiang Mai, Thailand.

National Conferences

18. Harish Bahadur, A.K.Srivastave, Rashmi, K.N.Sood, Ram Kishore, A.Basu, R.K.Sharma, S.B.Samanth, Vivekanand Bhatt, **Prem Pal,** and Sudhir Chandra, "Characterization of Thin Films of ZnO," *Proceedings, National Seminar on Ferroelectrics and Dielectrics (NSFD-XIII)*, Nov. 23-25, 2004, pp 401-05, New Delhi, India.
19. **Prem Pal**, Sudhir Chandra, K.N.Sood, Ram Kishore, and Harish Bahadur, "Physical characterization of RF sputtered silicon for MEMS applications," *Conference on Electron Microscopy and Allied Fields*, April 1-3, 2004, pp. 174-175, New Delhi, India.

References

1. **Dr. Sudhir Chandra**
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