Ravikumar Varadarajan

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EDUCATION

Ph.D. Mechanical Engineering January 2007
Case Western Reserve University, Cleveland, Ohio
Department of Mechanical and Aerospace Engineering
Dissertation: On the nature of static and cyclic fracture resistance of conventional and crosslinked ultra high molecular weight polyethylenes.
Advisor: Dr. Clare M. Rimnac. GPA 3.83 / 4

M.S. Mechanical Engineering May 2003
University of Illinois at Chicago, Chicago, Illinois
Department of Mechanical and Industrial Engineering
Thesis: Investigation of lumbar interbody fusion and its effect on the adjacent levels – A Finite element study.
Advisor: Dr. Farid Amirouche. GPA 5 / 5

B.E. Mechanical Engineering May 1999
University of Madras, Chennai, India
GPA 79 / 100, First class with distinction

RESEARCH EXPERIENCE

1. Research Associate, Case Western Reserve University Jan2007 onwards

- Mechanical characterization of fine composite cables for biomedical applications
- Evaluation of fracture resistance of monolithic and composite bulk metallic glasses

2. Graduate student (Ph.D), Case Western Reserve University 2003 – 2006
The goal of my PhD research was to investigate the fatigue and fracture resistance of conventional and highly crosslinked ultra high molecular weight polyethylene (UHMWPE).

This work involved the following projects:

1. Development of an automatic crack length monitoring system for fatigue crack propagation testing of UHMWPE.
2. Temperature and environment effects on the fatigue crack inception and propagation resistance of UHMWPE.
3. Development of a single specimen normalization technique to evaluate J-resistance curves
4. A novel optical method to experimentally quantify the fracture initiation toughness of UHMWPE.
5. Crack closure and overload effects on the fatigue crack propagation behavior of UHMWPE.
6. Near crack tip stress analysis using digital image correlation technique (DIC).

3. Graduate Research Assistant, University of Illinois at Chicago Sept 2001 - 2002
The goal of my Masters thesis was to study the combined effects of osteoporosis, disc degeneration and interbody fusion in human lumbar spine. This was accomplished using a parametric finite element model developed in ProEngineer and ANSYS.

RESEARCH INTERESTS

- Mechanical characterization of polymers, composites and other advanced materials
- Development of new testing methodologies for advanced materials
- Finite element analysis

INDUSTRIAL EXPERIENCE

Assistant Design Engineer May1999 – April2001
Mirza Tanners Limited, Kanpur, India.

Responsibilities: Design and development of leather processing and shoe manufacturing machines according to customer requirements.

Projects (Selected)

- Design and development of thermo-fusible press for shoe uppers.
- Redesign of an automatic leather dyeing drum and chemical mixing tank.

TEACHING EXPERIENCE

Graduate Teaching Assistant August 2003 – 2004
Department of Mechanical and Aerospace Engineering, Case Western Reserve University.

Courses: (i) Computational methods in Mechanical Engineering, (ii) Dynamics, (iii) Relation of materials to design

Graduate Teaching Assistant August 2002 – 2002
Department of Mechanical Engineering, University of Illinois at Chicago.

Course: Biomechanics

TECHNICAL SKILLS

- Tensile, J-R curves, J_{IC}, and fatigue crack propagation testing using Instron screw driven and servo-hydraulic materials testing machines.
- DMTA and differential scanning calorimetry
- Material testing software development using Labview
- Finite element simulation of crack propagation using Abaqus fracture mechanics tools
- Image processing

SOFTWARE SKILLS

C, C++, Visual Basic, Python, Matlab, Labview, AutoCAD, ProEngineer, Ansys, Abaqus, Gambit

AWARDS

- Student travel achievement recognition award, Society for Biomaterials Annual meeting, Pittsburgh, 2006.
- Case Prime Fellowship, Case Western Reserve University, Cleveland, 2003-2006.
- Academic proficiency award, Crescent Engineering College, India, 1997, 1998, 1999.

PUBLICATIONS

Presented at conferences (Selected):

1. Varadarajan R, Amirouche F, "Effect of Osteoporosis in a Disc - Degenerated Lumbar Spine", IV World congress of biomechanics - 2002, Calgary, Canada.
2. Varadarajan R, Amirouche F, "A finite element study of osteoporosis in a disc degenerated lumbar spine", Advances in Bioengineering, ASME – 2002, New Orleans.
3. Varadarajan R, Rimnac CM, "Fatigue crack inception and propagation resistance of highly crosslinked and post processed UHMWPE in a physiologically relevant environment", Orthopedic research society Annual meeting – 2006, Chicago.
4. Varadarajan R, Rimnac CM, "Static fracture J-R resistance of ultra high molecular weight polyethylene using a single specimen normalization method", Society for Biomaterials Annual meeting – 2006, Pittsburgh.
5. Varadarajan R, Rimnac CM, "The effect of fluid environment and crack closure on the fatigue crack propagation resistance of conventional and highly crosslinked UHMW polyethylenes for orthopedic implants", 9th International fatigue congress – 2006, Atlanta.
6. Varadarajan R, Vatamanu LO, Tuma C, Smith B, Lewandowski JJ, "Fracture and fatigue behavior of multi-strand implantable electrodes", Material Science & Technology, MS&T 2007, Detroit.

Journal Papers:

1. Varadarajan R, Rimnac CM, "Compliance calibration for fracture testing of ultra high molecular weight polyethylene", Biomaterials, 27(27), 4693-4697,2006.
2. Varadarajan R, Rimnac CM, "Static fracture resistance of ultra high molecular weight polyethylene using the single specimen normalization method", Biomaterials (under review).
3. Lewandowski JJ, Varadarajan R, Smith B, Tuma C, Shazly M, Vatamanu LO, "Tension and fatigue behavior of 316LVM 1x7 multi-strand cables used as implantable electrodes", Journal of Materials Science and Engineering A (under review).

REFERENCES: Available upon request