

STATEMENT OF PURPOSE

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Things that appear to be the simplest or the least important are generally the ones that are most complicated or most important. Of all the fields of engineering, this phrase is perhaps best suited to the field of Materials Engineering. Materials have played a key role in changing the very way we live, without anyone realizing their importance. Materials define the very age we live in. And the future will bring ever-increasing challenges and opportunities for new materials and better processing; thus the materials field will continue to play a major role in the enhancement of human life. Indeed the technological progress of any nation is and shall continue to be limited by the quality of materials that it can produce. Thus it is my penchant for the field and research, and the importance and wide scope of this field, which has motivated me to pursue my graduate studies in the field of Materials Engineering.

As undergraduate students we have been exposed to a variety of subjects in this field, thus it would be difficult to specify certain research area(s), but over the years I have been greatly fascinated by the fields of Materials Processing (especially with respect to Nanostructures), Polymeric Materials and Materials Characterization using Electron Microscopy. In line with my ambition of pursuing and excelling in research, I view completion of an advanced degree as a very important step, which is the sole motivation behind this application.

My fascination with the field of Materials Processing developed about a year ago when I did the course "MME 370: Manufacturing Processes". It was during this course that I came across the complexities involved with processing of various materials and the techniques used. Since then I have never looked back and been in association with the Powder Metallurgy Lab here at IIT Kanpur under a well renowned and distinguished Professor Dr. Anish Upadhyaya. My fundamentals regarding the field were further strengthened when later as a part of my curriculum I took a course on " MME 455: Advances in Powder Metallurgy" last semester in which I did exceedingly well being the highest scorer.

As I tried to know more and more about this field I came to know about the new class of materials - Nanomaterials, and the processes to fabricate them. It appeared to me that this field being a recent one would offer more opportunities in terms of research activities. As a result I am currently working on my senior year project entitled "Flame Combustion Synthesis of Silica Nanoparticles via a Diffusion Flame Reactor" under the supervision of Drs. Anish Upadhyay and D.P. Mishra. This is the first time that design and development of this kind of reactor is being attempted in India. Although there are no undergraduate courses related to Nanomaterials or Nanostructures in IIT, I learned much about this subject during my work on my senior year project. My work has been highly appreciated and oral presentation based on the design of the reactor has also been submitted for presentation in the conference of the Indian Ceramic Society to be held in January 2004 in Chennai, India.

Polymers represent another important class of materials, which despite its importance has remained underestimated for some time now. I was first introduced to this field when I did the course "MS 616: High Performance Polymers and Composites". The widespread use of polymers as a structural material has been limited mainly due to their low strength. However various forms of reinforcing agents and polymer composites have effectively overcome this problem. The field offers great promises in research, especially towards the development of micro and nanopolymer composites; giving rise to a class of materials that will soon replace metals as the structural materials of the future. Towards this end I have taken up another

course "ME 777: Plastic Part Manufacturing and Tool Design" during this semester, which will further strengthen my fundamentals in this field enabling me to take up research in this exciting area.

My interest in the field of characterization of materials also developed at about the same time, when we did a course of 'MME 342: Materials Characterization' in which we briefly touched upon the various tools used by researchers to study materials' structure. However, my specific interest in this field developed when as part of my other research experiences, after completing my junior year, I got a unique opportunity to work in the School of Physics and Materials Engineering (SPME), Monash University, Australia as a summer intern. I worked there for two months in the summers of 2003 on a project entitled "Effect of microalloying additions of tin on ageing behavior of Al-Cu alloys" under the supervision of Drs. Laure Bourgeois, and Barry. Muddle. A major part of the project involved studies of structures of aged Al-Cu alloy samples using High Resolution transmission Electron Microscopy (HRTEM). The use of HRTEM to view structures at atomistic level and other characterization techniques such as electron diffraction patterns greatly fascinated me. The exposure which I got in SPME was precious, as it strengthened my skills and gave me first hand experience of the stimulating work culture and environment of a research institute. My work was highly appreciated and the results obtained were so encouraging that parts of them would be corresponded in the Ninth International Conferences on Aluminium Alloys, to be held in Brisbane, Australia from August 2-5, 2004.

Embarking on a research career certainly requires a lot of preparation and I feel that I will not be found lacking in it. At IIT Kanpur, one of Asia's premier engineering institutions, I have received the best possible undergraduate education in Materials and Metallurgical Engineering. I have tried to attain an in-depth understanding of my courses as is evident from my academic performance. Till now, I have completed 23 courses in my major, and received 'A' grades in all but one of the courses. Currently I have the highest CPI (9.2/10) in my department, with the distinction of scoring SPI of 10/10 thrice; thus, excelling in the well-rounded and exacting undergraduate program in IIT, Kanpur. I have also received the 'Academic Excellence Award' for the years 2001-02 & 2002-03. The immense competition always keeps one on his toes and the extreme workload keeps one busy. It is this environment, which has made me capable of handling pressure situations and my academic record easily confirms that I am capable of doing so. The time bound assignments; term papers and projects, have helped me in developing an aptitude for meeting deadlines and to complete assigned tasks within the given time frame.

My ambition is to contribute in an original manner to the field of Materials Processing, Polymeric Materials and Materials Characterization, which I feel, will be facilitated at the Cornell University. The opportunities for education, research and industrial in the field of Materials Science are both comprehensive and pervasive at the same. These are the factors that have motivated me to choose the Department of Materials Science and Engineering at the Cornell University for my graduate studies. I believe the program offered will help me acquire the versatility needed to reach my full potential as a researcher. I plan to pursue an academic/research career on the above fields of endeavor; and I sincerely hope to be able to contribute something- however little might it be – to mankind's understanding of materials.

I therefore submit my application and request you to consider me for admission to your prestigious institution with full financial assistance.