

Travel grant application ITG 04-402

Conference title: Nanostructured and advanced materials for applications in sensor, optoelectronic and photovoltaic technology

Destination: Sozopol Bulgaria

Date of conference: 6th-17th September 2004

The purpose of attending this conference last year was to learn new developments in the area of nanofabrication, synthesis and characterization of nano-materials and their applications in chemical and biological sensor technology. My supervisors agreed that it would give me the opportunity to meet with other PhD students, post docs and professors in my area and accelerate my knowledge experimentally and initiate innovative ideas. The opportunity to interact within a multi-cultural environment with leading researchers would be highly beneficial in the progression of my PhD research.

I went to Bulgaria to present a poster and to hopefully gain some feedback about the work that I was carrying out at my institute. My PhD covers an in-depth chemical experimental side and leads to characterisation using surface sensitive machinery to determine the viability of the chemical methods that I employ. My PhD started in September 2003, from that point I have completed a large literature review on the chemical purification (functionalisation) of carbon nanotube materials. I experimentally carried out many of the publicised chemical purification methods and then went on to determine any structural changes that had taken place using Raman spectroscopy and X-ray photoelectron spectroscopy. At my institute there are many people who are experts in structural characterisation using the two spectroscopic methods mentioned. However I am the first PhD student to work with carbon nanotube materials, so therefore I am the expert in this area at my institute. Personally I felt that it was vital that I attend a conference in which I would meet with other people working in this area and let them judge my research and give feedback. Prior to my visit I was nervous about the outcome but excited to hear an expert's point of view and analysis of my research. To analyse my results, I have always searched the literature but this is only the first stage of learning, to get an insight of the research I needed to speak with the experts.

I heard about this particular conference through a professor at my university who had worked with one of the organisers of the conference. I acquired the program for this conference beforehand and recognised many of the lecturers' names from papers that I had been concentrating on, such as Professor Yury Gogotsi. This professor and his research group focus on biomedical applications of carbon nanotubes, which is the second phase of my PhD research. Before going to Bulgaria I organised many of the papers that had been written by the lecturers attending the conference with questions that I wanted to get answered.

When I arrived in Bulgaria, they had a welcome party on the first evening. This gave everyone the opportunity to introduce themselves and their research. There were people from all over the world attending the conference. The conference was an English speaking conference, however one thing that I did learn from this experience is the fact that having only one language is not enough. I speak basic French and some German. However since my return I had been learning to speak German.

The conference itself was packed with lectures everyday. In general the lectures started at 8am and went on until 1pm in the afternoon and recommenced at 5pm to 8pm. So the afternoon between 1pm and 5pm was left as free time. This was maybe the most important time where most discussion took place, at the beach, at the coffee shop or over some lunch. The organisers of the conference were very precise at time keeping for

example if a lecture ran over the time they would immediately stop the lecture to move to the next scheduled lecture. There were many areas of research and topics covered at the conference. The lectures that were important for me were exceptional. There were poster sessions everynight. I presented my poster on the third night into the conference. My poster consisted of Raman and X-ray photoelectron characterisation results. The organisers provided refreshments during the poster sessions so there was always a good turn out of people everynight. There were many questions about my research. As I had expected I did get alot of feedback from others who were concentrating on similar work. There were many things suggested to me. One suggestion made was to never present bar graphs without error bars and to check noise parameters of the two machines that I use and present this data with the data acquired from my samples. It was also suggested that surface sensitive methods do not measure the bulk of the sample if the sample is less than 100nm in thickness and also different substrate samples interact differently with the Raman lasers used. This point can be used to your advantage as the signal using specific substrates with a specific laser gives a more enhanced signal. Many of the researchers present at the conference commented on my poster as being very informative and clear. I gained a great deal of confidence during this particular night. It clarified for me that my research was worthwhile and that I could communicate effectively to others about my work. There are times during your PhD that you are faced with problems, which makes you feel that the research you are carrying out is not worthwhile. It helps to speak with other people who have had similar problems or can provide some suggestions to solve the problem.

During the conference I met with many people and made many contacts. Every night there would be groups of people going for dinner together or to an outside concert together or just having a coffee together. There was more research discussed and more ideas generated during the course of an evening when everyone had time and the conversation was more relaxed.

The second phase of my PhD is to use the purified carbon nanotubes as a biosensor for DNA sensing applications. My poster provided details of this fact. I spoke with one lady called Professor Arzum Erdem from a Turkish University. Arzum has published many DNA biosensing papers and was interested to here my future plans. We had many discussions about the direction of my work. We kept in contact with many discussions being held and then it was decided that Arzum would come and work at our institute for a month to carry out some experiments.

I apologise for the late submission of this report but I wanted to include the collaborative work with Arzum in this report. We successfully got a grant for Arzum to visit us and she was here for one month and left yesterday. We completed one month of very successful tests using carbon nanotubes and specific strands of DNA for biosensing experiments using electrochemistry. We expect to have at least one paper from her visit and maybe two with some of my Raman and X-ray photoelectron results included.

To conclude my report, I would like to thank you for the opportunity to visit the conference in Bulgaria. I gained many ideas and received helpful advice regarding my research. I have submitted a paper of the results that I presented in Bulgaria last month. I had the opportunity to work with Professor Arzum Erdem who is a well-known expert in DNA biosensing applications. Arzum made it possible for me to progress into the second phase of my PhD and helped extend my knowledge extensively in the past month. We plan to write the paper very soon and submit it quickly as this area of carbon nanotubes and DNA biosensing is an extremely popular and competitive research area.

I had very high expectations for the conference in Bulgaria but I obtained much more, with the result of a healthy collaboration with Professor Arzum Erdem in Turkey and maybe a future visit to Turkey for one month in the summer to continue our exciting research !

