

Summer Research Experience

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This year's internship at physlab at LUMS SSE offered me a unique experience. I was assigned to complete the experimental apparatus that was to be sent to Institute of Space Technology (IST), Islamabad. The experiments which I had to complete were the experiments on Heat Transfer and latent heat of vaporization of liquid nitrogen. The main task was the Heat Transfer experiment. In this experiment, a cup shaped heat insulator was used for better results. Physlab was using Alumina Silicate for that purpose but, as I came to know, it was not available in Pakistan. So, I had to find a material with properties similar to Alumina Silicate.

First, we tried to do it in the lab using only raw materials such as sodium silicate, marble powder and some resin but after long experimenting with their different ratios, it was not found to be suitable.

In due course, I also got a great experience on a machine that I had never seen or heard of before: The Lathe Machine. I had to go through its manuals, watch videos of it and see people working on it before actually operating it myself. The first lesson I learnt on it was: **cleaning**. Before doing any work on it, we had to oil it and clean it for its full performance. I found it to be a very useful machine since we could make a lot of things in the lab which had to be bought otherwise.



So, back to the material, an alternate was suggested by Sir Wasif Zia: to use a thermal brick. These bricks are used as insulators in furnaces. After a lot of experimenting with it and one whole day of filing it, it was found to be too rough for the job!

Now, I had to go to the local market myself. I was accompanied by the two most experienced people: Mr. Mannan and Haji Akhtar Sahib who proved to be of great help while searching for this material. After one long day we acquired some fire-clay and a strange material that the local people called as "**Sandanium**". They told us that it was used in extreme temperatures in furnaces for insulation. We tried to make cups out of fire clay but it was useless as they were too soft. So, we turned our attention to "Sandanium". After much googling, and knowing the fact that was told to us by the shopkeepers that it is somehow related to asbestos, I found it as "Sindanyo". It is an international trade name for Asbestos and contains 50% chrysotile. It is used as a heat insulator in furnaces and other places. So I, with the help of Mr. Mannan machined one cup out of the sheet on lathe and tested it in comparison with the Alumina Silicate cups that we were using. The level of insulation was found to be almost the same. So, finally, we could use Sindanyo cups in place of Alumina silicate cups. We machined three cups that were required. In due course, other material for Heat transfer also arrived and I completed three setups to be sent for IST.



Finally, the day came when these setups were ready to be sent for IST. It was a moment of true glory after hard work. It was a unique and interesting experience for me. I hope that these setups work extremely well at IST and provide a good insight into physics for the young students. I also hope that these collaborations continue in the future as they help promote Science in Pakistan.

I would really like to thank Dr.Sabieh Anwar, Sir Wasif Zia and all the other physlab staff for helping me and continuously guiding me through this process.

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