

Developments of Gas-Pressurized High-Pressure μ SR Setup at The RIKEN-RAL Muon Facility

I. Watanabe¹, Y. Ishii¹, T. Kawamata¹, T. Suzuki¹, F.L. Pratt², R. Done³,
C. Mohammad³, C. Goodway³, J. Dreyer³, C. Smith³, and M. Southern³

¹*Advanced Meson Science Laboratory, RIKEN Nishina Center, 2-1 Hirosawa, Wako, Saitama, 351-0198, Japan.*

²*ISIS Muon Group, Rutherford-Appleton laboratory, Chilton, Didcot, Oxon, OX11 0QX, UK.*

³*ISIS High-Pressure Group, Rutherford-Appleton laboratory, Chilton, Didcot, Oxon, OX11 0QX, UK.*

The RIKEN-RAL Muon Facility can provide higher-momentum muons of up to 120 MeV/c. One important application of this higher-momentum muon beam is in high-pressure experiments. Since μ SR can sense magnetic properties of materials in the ideal zero-field condition, the demand for high-pressure μ SR experiments has been growing recently to investigate the magnetic properties of organic materials, strongly correlated systems etc. We have collaborated with the high-pressure group of RAL since 2005 and a gas-pressurized high-pressure system has been developed for the RIKEN-RAL Muon Facility. The gas-pressurized system has an advantage in being able to change the pressure continuously without any change in sample conditions.

Figure 1 shows the high-pressure cell itself and figure 2 displays a He-gas intensifier to pressurize the cell. The pressure in the cell is held by a normal Bridgman clamp and piston, which are located at the rear of the cell. The material of the cell is CuBe. The diameter of the sample space is 18 mm and the depth is about 8 mm. The sample volume is about 2 cc. The maximum pressure is 6.4 kbar and the cell can be cooled from the room temperature down to 1.5 K. The He gas is compressed to up to 2.7 kbar using a high-pressure compressor. When we need more than 2.7 kbar, we use the intensifier.

The system has been tested and applied to real measurements from April 2008. In our presentation, we will explain about the performance of our gas-pressure system and show a test result on Sn powder.

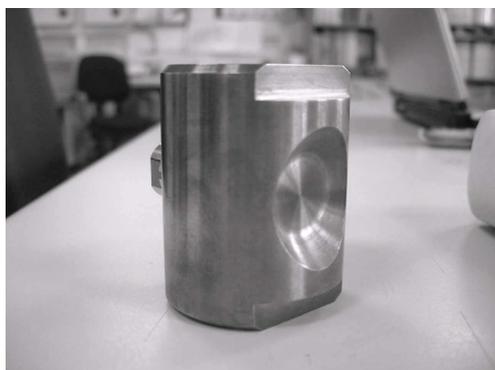


Fig.1: Gas-pressurized high-pressure cell.

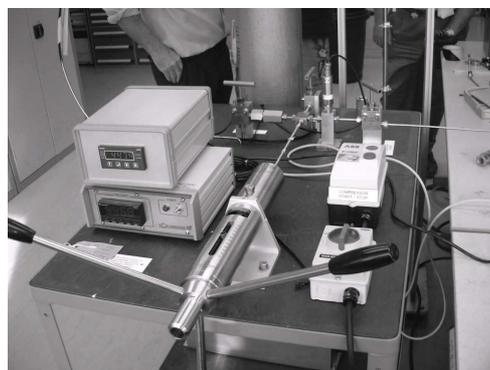


Fig.2: He-gas intensifier.