

Microsymposium

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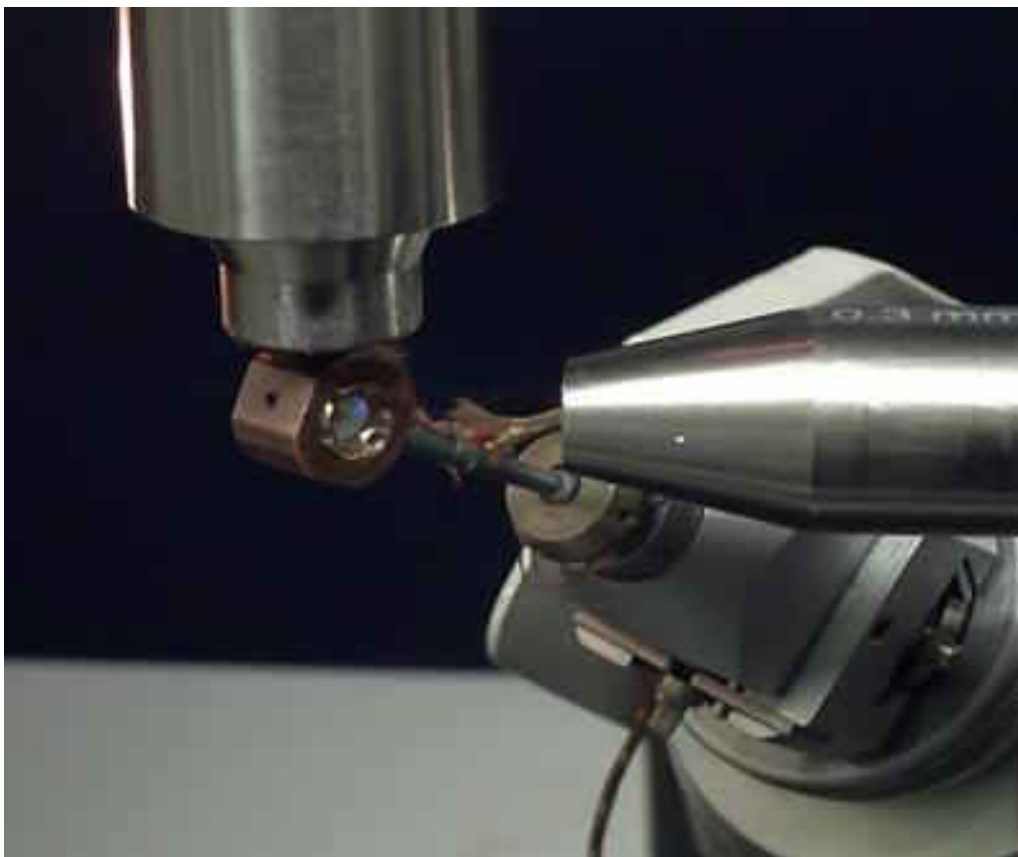
Instrumentation development for crystallography at high-pressure

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Historically high-pressure (HP) research has been an area that is heavily dependent on the availability of the experimental equipment. Many of the discoveries in HP science followed promptly from breakthroughs in instrumentation development, which provided researchers with higher pressure limits or larger sample volumes. A limited availability of commercial pressure cells and the need to remain at the cutting edge of the research make it likely that anyone working in this field will at some point engage in designing new or in modifying existing HP equipment. This presentation aims to introduce an engineering approach to developing pressure cells and to present such generic tools as computer aided design (CAD) and finite element analysis (FEA). The use of engineering methods in the design of HP equipment will be illustrated using recently developed pressure cells. This includes some new devices for neutron scattering such as gas-driven sapphire anvil pressure cell for changing pressure at cryogenic temperatures in neutron diffraction experiments [1]. Another example is a gas loader for the P-E press which can be used to load gases into the sample space at elevated pressures for subsequent studies of gases and gas mixtures as well as for use of gases as pressure-transmitting media to pressures of over 18 GPa [2]. The examples of use of FEA for miniaturization of the pressure cells and their components will include miniature pressure cells for X-ray diffraction with cryo-flow refrigerators shown in the Figure below [3].

[1] M. K. Jacobsen, C. J. Ridley, A. Bocian, et al, *Rev. Sci. Instrum.* (submitted), [2] C. L. Bull, A. Bocian, H. Hamidov, et al, *Rev. Sci. Instrum.*, 2011, 82, 076101, [3] G. Giriat, S. Moggach, S. Parsons, et. al. K. V. Kamenev, (in preparation)



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