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METHODS IN ELASTIC SCATTERING

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The session consisted of seven talks devoted to very different topics. The common essence of the talks I would distillate as follows:

Fundamental remarks

1. There is a continuous growth of interest in small-angle scattering and in reflectometry. (To my opinion this tendency remains valid at least for the next ten years).

2. The time-of-flight methods used at the pulsed source are incredibly efficient for carrying out elastic scattering measurements.

3. Proper instrument design even at modest flux allows to carry out unique investigations.

The most remarkable experimental results

- thanks to the methodical efforts the minimum size of the samples under investigation now varies between 20 and 100 mg, which makes it possible to investigate very expensive and tiny pieces of matters like high-T_c superconductor crystals, fullerenes, etc. (J. Jorgensen, ANL);
- real time experiments were done studying the intercalation kinetics of inert gases in C_{60} with characteristic measuring times from 5 minutes up to 24 hours (J. Jorgensen, ANL);
- a large variety of surface phenomena was studied on the new reflectometer SURF which has five times higher intensity at the sample position then the CRISP machine (D.Bucknall, RAL), e.g.:
  - Tris-chromophore oligomer LB films;
  - Thin PS film stabilized by a high molecular weight monofunctional telechelic PS;
  - Buried melt interfaces (amorphous PS and crystalline PE copolymers);
  - Time and pH dependence of the dichain cationic surfactant hydrolysis;
  - SURF will be potentially the most attractive facility for surface chemistry investigations;
- by the use of the upgraded QENS inverse geometry spectrometer the quasi elastic patterns can be investigated over almost unlimited Q-range, with resolution about 70 μeV. Amongst others the motion of the hydrogen in Cs-graphite intercalate was studied (F.Trouw, ANL);
- phase transitions in mercury High-T_c and in KNO_3 were observed. at relatively low pressure (6 kbar, J. Jorgensen, ANL) and at higher one (3 GPa, D.Sheptyakov, JINR);
- "in situ" investigations of the behaviour of High-T_c superconductors under high pressure, e.g., mercury-HTSC (J. Jorgensen, ANL).

Methodical improvements

The physical results enumerated above were obtained thanks to application of many methodical tricks such as:

- increase of the flux on the sample using focusing collimators or/and curved focusing supermirrors; supermirror neutron guides (ANL, RAL);
- increase of cold neutron flux installing cold moderators (solid methane, ANL);
- increased the efficiency of data collection by the use of large area detectors (all labs.);
- optimization of instrument performance (ANL, JINR);
- applying better data reduction methods (Rietveld refinement, ANL, RAL, JINR);
- the wide variety of the sample environment (SURF in RAL);
- decrease of the background (!)
  - MgO filter for fast neutrons (ANL);
  - curved guides (JINR);
  - focusing collimators (ANL);
  - improving the shielding of the sample environment (ANL);
- these improvements gave rise to the considerable widening of the scattering intensity range (up to 5 order) and the range of the momentum transfer down to $2*10^{-3}$ Å $^{-1}$ and up to tenths of Å^{-1}.
- Involving the high pressure into the arsenal of external parameters a wide area of new phenomena becomes accessible.

Conclusions

Although the talks did not deal with the far future projects, we can deduce from the experience of these works many important messages for the future instrumentation programmes:

- Think about the best performance of the instrument!
- Be careful with the background! (Remember: the largest amount of the background originates from the your own instrument, including the sample!).
- Do less, but better!