

50 Years of Neutron Backscattering Spectroscopy



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Besides the high count rate, the strongest advantage of BASIS is a combination of the high energy resolution and broad range of energy transfers. The former is sufficient for resolving the slower translational dynamics. The latter allows probing the faster localized dynamics. Simultaneous measurement of multiple components provides a powerful tool for studying the spatial characteristics of “soft” confinement, when the transient cage made by particle neighbors relaxes on the resolution scale of the experiment. While the science supported by BASIS is diverse, the unifying theme of many seemingly disparate projects is the power of QENS to elucidate the spatial characteristics of the microscopic diffusion and relaxation processes through the Q-dependence of scattering signal. The near-backscattering arrangement of the detectors at BASIS helps eliminate systematic bias in the energy resolution at low scattering angles, which is characteristic of exact backscattering geometry, thereby yielding unbiased Q-dependence of the data at low momentum transfers. The relatively high, for a backscattering spectrometer, Q-resolution of BASIS, is also instrumental for extracting the spatial information on the microscopic dynamics. The instrument upgrade includes a full set of Si(311) analyzer crystals, which much extends the accessible Q- and energy transfer range.

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