1. SPEC

to study the structures, dynamics, and functionality of

large hierarchical systems, including liquids, colloids, polymers, foams, gels, and granular and biological materials. The wide reach of the instrument’s user base also includes investigations into energy materials and magnetism.

Studies of Life

Spectroscopy research on the steady-state conditions of samples is routine, and a TOF

spectrometer is an essential instrument at any neutron source. Limited beam intensity at

existing neutron facilities, however, has left research on time-dependent responses along varied time and length scales in the exploratory stages.

will enable in operando studies of electrolytes,

pump-probe experiments on photosensitive materials, and the investigation of small

samples in extreme sample environments/

Among C-SPEC’s strengths is that it can be used to study live cells. The instrument

marries well-known technologies with the possibility to provide a great neutron signal-to noise at the highest energy resolutions. This is essential to improve our

understanding of, for example, biological systems in which the mobility of hydrogen or

water is crucial to their function.

Two-Mode Chopper and Exchangeable Guides

Neutron spectroscopy measures the atomic and magnetic motions, or random movement,

of atoms. Studying such dynamics is necessary to learn the inherent physics of phase

changes in materials and to identify basic characteristics such as diffusion coefficients,

thermal conductivity, specific heat, and dielectric properties.

1 режим - мультиэнергичный, 2й - обычный

Одна секция - обычная, другая - сильно фокусирующая

One guide configuration will accommodate

experiments in single-crystal spectroscopy by providing a homogenous distribution of

neutrons on the crystal, while the other is optimized for small samples and situations

where access to the sample is restricted on account of a controlled sample environment.

This second guide delivers a high flux, focused beam necessary for pump-probe and

externally driven experiments.

Thus C-SPEC will perform extremely well for quasielastic neutron scattering studies covering a wide time range, from sub-picosecond to about one nanosecond, in which atomic and molecular motions can be studied. This is for instance important for understanding the molecular motions in liquids, biological membranes, polymers, proteins, and many other systems.

Novel Research in Geoscience, Magnetism, and Energy

Geoscience research into the diffusion of water under extreme pressure holds considerable promise for expanding our knowledge of the hydrogenated systems of Earth’s mantle and extraterrestrial environments such as outer planets, moons, and comets.

In the field of magnetism, spectroscopy experiments on highly frustrated magnets, spin

ices, and spin liquids can reveal the secrets to better computer data storage and RAM, and

can contribute to our understanding of the elusive mechanisms of high-temperature

superconductors.

will also contribute to the development of energy materials at the farthest reaches of innovation. It is an especially powerful tool for probing the electrolyte properties in applications such as lithium batteries and fuel cells. In combination with nuclear magnetic resonance (NMR) technology, the CSPEC innovations can improve our comprehension of the dynamics of protons in polymer electrolyte-based lithium batteries.

So-called pump-probe experiments, with laser excitation, can enhance our surprisingly

limited knowledge of photosynthesis. Through time-resolved measurement, using

synchronized neutron and photon pulses, information can be gathered about the light

harvesting and internal dynamics of pigment-protein complexes.

**C-spec 2013**

For the scientific challenges of the future, a multitude of different research fields will benefit

from a cold direct geometry chopper spectrometer. The areas range from biological and soft

matter materials, materials science questions or novel magnetic quantum materials. Common

to these diverse fields is the fact that they all require an instrument capable to probe time

scales from pico to nanoseconds on a length scale from Ångström to nanometers. Moreover,

there is a trend, and also the necessity, to investigate not only model systems but materials

that are more realistic and hence technological more relevant. That often implies higher

complexity of the investigated systems. This complexity can be for instance in composition

when moving away from isolated substances to composites or crowed solutions. For a

detailed understanding, the dynamic landscape needs to be probed over a large scale, i.e. it

is mandatory to access different time domains experimentally.

**VOR (proposal 2014)**

**Функциональные материалы**

Фуллерены и углеродные нанотрубки: использование в литиевых батареях, частей топливных ячеек, транспорта лекарств, наноэлектроники и сенсоров.