

Molecular Motion is the Key to Life



Alexei Sokolov

Governor's Chair, Professor Group Leader at Oak Ridge National Laboratory

CURRENT RESEARCH

Molecular Motions and the Effort to Improve Matter

Soft matter is a large class of materials that includes liquids and liquid crystals, polymers and colloids, and biological materials. They are defined by their ability to easily move between different conformational states. Soft matter can move into many different metastable states without wasting much energy or effort. Dr. Alexei Sokolov and his research team study molecular motions and the ways to control them by tuning structure, chemistry and molecular interactions in liquids, polymers and in biological systems.

The study of molecular motions is used to design novel materials with significantly improved performance in comparison to the materials currently used in various technologies.

These molecular motions are important for many different applications. Among them:

- Energy storage and batteries
- Water desalination and water purification
- Carbon capture and natural gas purification
- Drug delivery and bio-preservation

Sokolov and his team work to answer questions like, "How can we move water through a polymer membrane but reject all the salts?" "Can we efficiently separate certain gas molecules by moving them through polymer membranes?" It all comes down to the study of how can we selectively control molecular motion through different materials. The research team focuses on controlling molecular motions, the key to life in biological materials and vaccine preservation, the key to water purification and reduction of carbon emission, and enhancement of ion motions to improve battery performance.

Sokolov has a patent in biopreservation, where the research team...

AFFILIATION

The University of Tennessee, Knoxville

EDUCATION

- Doctor of Science (Habilitation)
- PhD, Physics

RESEARCH AREAS

Technology, Materials Science / Physics

FUNDING REQUEST

Requested funding of these projects will fund salaries for people developing the technology, chemicals, and service fees for use of some analytical instrumentation.

Bio-preservation of vaccines, blood - \$2M

Polymer electrolytes for more efficient batteries - \$1.5M

Polymer membranes for CO₂ separation - \$1.5M

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