

The Leibniz-Institute for Crystal Growth (IKZ) is a leading research institution in the area of science & technology as well as service & transfer of crystalline materials. Our goal is to enable solutions for urgent societal challenges (e.g. communication, artificial intelligence, climate protection, health etc.) by modern electronic & photonic technologies. The work covers the full spectrum from basic over applied research up to pre-industrial development and is performed in collaboration with national and international partners from university, academy and industry. The institute is part of Forschungsverbund Berlin (<https://www.fv-berlin.de/>) and a member of the *Leibniz Association* www.leibniz-gemeinschaft.de. You can find more details on the institute webpage: www.ikz-berlin.de.

Commencing as soon as possible there is an opening for a

PhD position (m/f/d)

“Laser cooling in rare-earth-doped fluoride crystals”

Laser cooling, or optical refrigeration, of solids is a recent emerging technology enabling to cool solid materials down to cryogenic temperature by laser excitation. This novel technology is getting attention for ultra-compact cryocoolers for space applications and thermal-issue-free high power solid-state lasers, so-called *radiation balanced lasers*. The cooling process is based on the so-called *anti-Stokes fluorescence* which can efficiently extract phonons, *i.e.* heat, from rare-earth-doped fluoride crystals. Systematic studies on a variety of crystals are strongly demanded to understand the light-matter interactions, to reveal their potential, and to bring this technology closer to the application. Key prerequisite will be a proper control of the quality and purity of the grown crystals that are to be prepared during the PhD work. The grown crystals must then be investigated and evaluated, the results fed back into the growth process for further improvement, to finally demonstrate refrigeration experiments. IKZ offers ideal conditions to pursue this research as it combines the competences in bulk crystal growth technologies and in the application-oriented characterization of optical and laser materials.

The following tasks are planned during the PhD work:

- Growth of high-quality fluoride single crystals doped with rare-earth ions (ytterbium, thulium, erbium, and holmium) by the Czochralski and the vertical gradient freeze methods with optimized growth parameters such as crucible materials, atmosphere, doping concentration as well as pre-treatment procedure of the starting materials.
- Spectroscopic investigation of the grown crystals (e.g. absorption, photoluminescence, time-resolved emission, etc.) from room temperature down to cryogenic temperatures.
- Compositional investigation of the grown crystals (e.g. ICP-OES, X-ray fluorescence spectroscopy, and X-ray diffraction).
- Experimental evaluation of cooling performances with the grown crystals, including setting up a home-built system, with respect to the crystalline host material, impurity level, doping concentration, and other material properties.
- Investigation of possibilities to realize radiation balanced lasers

The applicant must have a MSc degree in physics, materials science, or in a related discipline. A sound knowledge in solid state physics is mandatory. Successful applicants need experimental skills, initiative and flexibility, and favorably bring in hands-on experience in either crystal growth, laser physics, optical spectroscopy and/or crystallography. We presume that the applicant can carry out structured scientific work and set own scientific goals within the subject. We work as highly motivated team of researchers and technicians. Because of the international team, good English language skills (level B2) are a prerequisite.

The position is limited to three years. Payment is according to 75% TVöD Bund, treaty for German public service. IKZ is an equal opportunity employer. Therefore, female candidates are encouraged to apply and will be preferred in case of adequate qualification. Among equally qualified applicants, preference will be given to disabled candidates.

For information about the project contact Dr. Hiroki Tanaka, mail: hiroki.tanaka@ikz-berlin.de, phone: +49 30 6392 2821.

Have we aroused your interest?

Then apply with a letter of motivation for this project (1–2 pages), curriculum vitae and all relevant certificates by 30th April 2020. To do so, please go to **Job offers/jobs** on our homepage and click on this advertisement and then on "**Apply online**". Please send us your complete application documents this way.

We look forward to receiving your application!