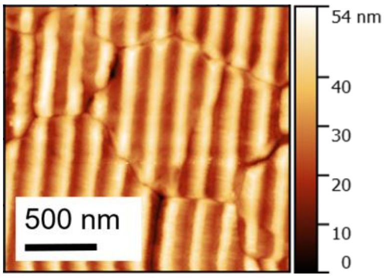
Karlsruher Institut für Technologie

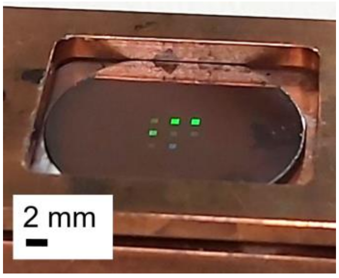
Lichttechnisches Institut
Engesserstrasse 13
Geb. 30.34
76131 Karlsruhe
www.lti.kit.edu

Bachelor/ Master Thesis/ Internship

Development of perovskite films as optical gain medium for laser applications



Oberfläche des Perowskit-Kristalls mit Nanostrukturen



Perowskit Mikrolaser mit eingeprägter Resonatorstruktur

Research Field
Experimental

Studies
Electrical Engineering, Physics and related subjects

Start
Flexible

Motivation

Perovskite semiconductors have emerged as a new class of promising materials for light-emitting applications, such as lasers and LEDs. The unique strengths of these materials come from the combination of the benefits of inorganic semiconductors, like high absorption coefficients and charge carrier mobilities, with the broad spectral tunability and fabrication flexibility of organic semiconductors. In fact, perovskite films are compatible with several solution processing techniques, such as spin-coating and inkjet printing, which allows high output in a laboratory setting and are compatible with mass-production. To form a laser, the perovskite layer can either be deposited on top of a resonator structure (e.g. a nano-grating) which forms the laser cavity, or the grating pattern can be easily transferred to the completed perovskite layer via thermal nanoimprint lithography. Potential applications of perovskite laser sources include integrated optics, such as sensor systems, and advanced display technologies.

Task

The experimental section of this work will involve preparing perovskite layers via spin-coating and optimizing said layers by examining different processing parameters and additives. Laser devices will be fabricated from optimized layers by imprinting a distributed feedback (DFB) resonator into the perovskite film via nanoimprint lithography. For analysing the uniformity and optical quality of the samples, and the performance of the finished laser devices, a variety of characterization techniques will be used such as atomic force microscopy (AFM), steady-state and time-resolved photoluminescence (PL) spectroscopy, etc.

Prerequisites

The primary prerequisites for this work are: a pleasure and skill in independent experimental work, the ability to effectively communicate with a larger team, and an interest in new topics and approaches. Basic knowledge in the field of semiconductor physics and lasers is advantageous but not essential.

Contact
Isabel Allegro
Engesserstr 13
Geb. 30.34 R.118.2
+49-721-608-47721
isabel.allegro@kit.edu