ePIXnet Winterschool 2007
A silicon laser with gain in doped liquid crystal

Wout De Cort, Roel Baets, Kristiaan Neyts
Ghent University

For years, researchers have been looking for an efficient laser based on silicon. Such a device would have numerous applications and its development would be a huge step towards all optical processing of data. Here, a route to a silicon laser, which will be tunable as well, will be presented. The structure of the laser (cavity, waveguides and reflectors) is defined in silicon-on-insulator (SOI) and is thus compatible with the widespread CMOS-technology. Gain and tuning are achieved by applying a doped liquid crystal (LC) top-layer. Semiconductor nanocrystals with a bandgap of approximately 0.8eV act as dopants. The nanocrystals are optically pumped and part of the light generated through spontaneous emission couples into the laser cavity. Stimulated emission causes amplification while the light bounces back and forth in the cavity. The laser wavelength can be tuned by applying an electric field on the LC layer. The research is still in an early stage so mainly the working principles and some theoretical considerations will be discussed as well as first experimental results. These results are about LC doping, luminescence and LC-molecule orientation on a SOI structure. Finally an outline for the future will be given, including experiments and expected difficulties.

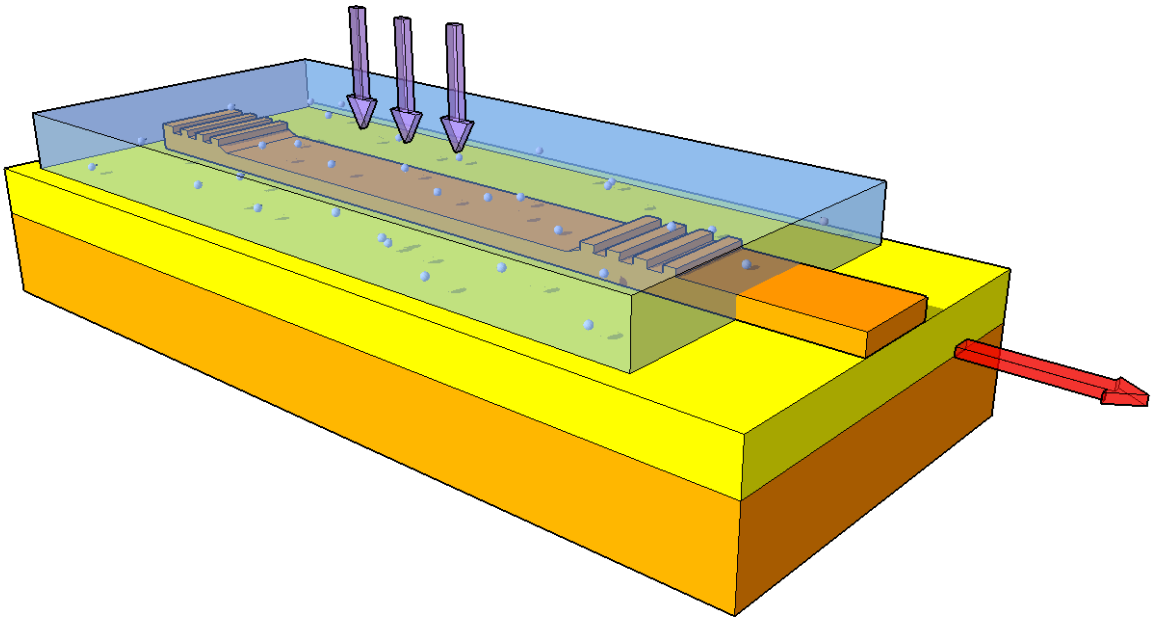

Figure: Simplified view of the laser structure.