Optical Sources for Sensing for Nano-CEMMS

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Goals

- Design and fabricate high power Vertical-Cavity Surface-Emitting Laser (VCSEL) arrays and wavelength selective photodetectors.
- Integrate VCSEL arrays and PIN photodetector into optofluidic microsystem.
- Demonstrate biomedical and/or chemical composition sensing as first step toward medical “tricorder”.

Research Results

- Integration of VCSELs into optofluidic microchip.

Mapping to Center’s Objectives

- Monitoring and sensing of microfluidic channels.
- Perform biomedical and/or chemical composition sensing.

Fundamental Questions/Challenges

- What level of integration and sensitivity can be achieved?
- What are appropriate applications for such a microchip?

Research Plan

- Fabricate monolithic VCSEL / detector for fluorescence polarization and fluorescence spectroscopy.
- Integrate VCSEL / detectors into optofluidic microsystem.
- Perform biomedical and/or chemical composition sensing.

Broader Impact

- Potential applications in biomedicine immunoassays, nucleic acid analysis, and combinatorial chemistry analysis for future health care.

Interaction with Other Projects

- Interaction with Profs. Kenis’s and Cunningham’s groups on opto-electronics, microfluidics, and biochemistry applications.

Future Efforts

- Increase functionality of optofluidic microchip by integrating VCSELs with different wavelengths and more complex microfluidic network.