2.3 μm ROOM TEMPERATURE DIODE LASER FOR SPECTROSCOPIC APPLICATIONS

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Low-cost room-temperature InP or GaSb Fabry-Perot diode lasers are now available (Laser Components GmbH) for wavelengths between 1.8 and 2.4 μm. We have evaluated one such laser as a way to extend the range covered by mid-infrared Pb-salt diode lasers, which are typically available from 3 to 30 μm. Our laser (Model FNIR-2344-GMP) was mounted in a TO3 case, so in order to use it in the usual laser source dewar (e.g. Laser Photonics L5736), it was necessary to construct a mounting adaptor. The laser could then be used with the same current source (L5830), collection optics (L5120), monochromator (L5110), calibration etalon (5 cm solid Ge), and detectors (InSb) used for our Pb-salt lasers. Output power was huge (>5 mW) by Pb-salt standards, and by varying the temperature from 200 to 315 K it was possible to obtain wavelengths from 2.25 to 2.41 μm (4150 - 4450 cm^{-1}). Like a Pb-salt laser, the new source could be rapidly tuned with a current ramp, enabling direct spectral observation on an oscilloscope. Interestingly, the tuning was 'backwards': higher temperature and/or current gave lower wavenumbers.

So far, the new laser might seem to be ideal for sensitive IR laser spectroscopy around 2 μm. Unfortunately, however, it displayed vices which also affect Pb-salt lasers, such as instability, multi-moding, and extreme sensitivity to optical feedback. Regions of 'good' tuning behavior were very limited: temperature and current generally had similiar effects on modes (unlike many Pb-salt diodes). Overall, the new laser showed promise as a source for high resolution spectroscopy, but was not really usable unless a good mode luckily ocurred in just the right place. Interesting questions remain: Will different samples be similar, or will they show large variations in spectroscopic suitability, as with Pb-salt diodes? Can some of the abundant output power be sacrificed to obtain more civilized tuning behavior?