1 Draft of Term Project

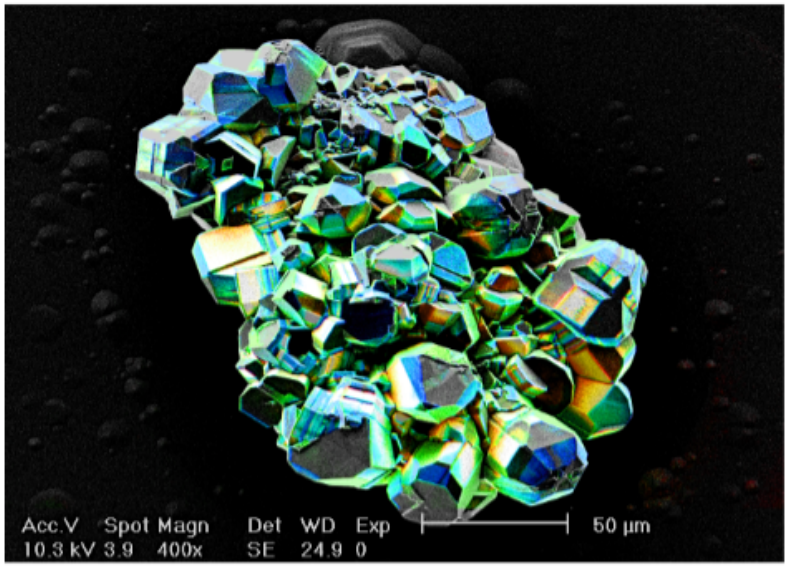
Use **Canvas** to submit a draft of your term project.

Refer to the Term Project Assignment for complete details. Remember that the question and solution should start on fresh pages. Check the rubric for additional requirements.

You will get anonymous peer feedback on your draft, which can help guide your revisions. You will also be asked to give anonymous peer feedback to two class mates (this will be managed using Canvas).

Engaging in the process of drafting and revising is worth 20% of the final grade for the term project. The points will be part of your final grade for the term project. Your final portfolio will include this draft, and a record of the feedback that you received.

2 Light emitting diodes



To make blue light emitting diodes (LEDs), technology companies combine the elements indium, gallium and nitrogen in the correct ratio to make InGaN crystals. The figure above shows a small InGaN crystal. To make red LEDs, technology companies combine aluminum, gallium and arsenide in the correct ratio to make AlGaAs crystals.

InGaN and AlGaAs crystals are both semiconductors (see Q11.6). In a semiconductor, there are quantum states with relatively low energy that are almost fully occupied by electrons. Additionally, there are quantum states at higher energies that are not usually occupied by electrons. The energy gap between the low-energy and high-energy quantum states is called the "band gap". To operate an LED, a battery injects electrons into the high-energy states. These injected electrons then fall into low-energy states and release photons. The size of the energy jump determines the color of light that is emitted.

(a) Estimate the size of the energy gap in InGaN. Give your answer in eV or joules.

(b)Estimate the size of the energy gap in AlGaAs. Give your answer in eV or joules.