**Semiconductor Module 2a: Photolithography**

**Pre-Lab Questions**

1. *What is the main difference between positive and negative tone photoresist? What are the pros and cons of each resist?*

The main difference between these two methods of microlithography is that the positive photoresist leaves the same pattern as the mask, while the negative alternative holds the reverse. A table of the pros and cons are listed below.

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|  | **Pros** | **Cons** |
| **Positive Photolithography** | * Better step coverage | * More expensive |
| **Negative** | * Wet chemical resistance * Better adhesion to silicon | * Resist mass swelling |

1. *What is the composition of a typical photoresist? Why does the photolithography lab usually require yellow light for illumination?*

Positive photoresists usually contain a photoactive compound, a polymer resin, an organic solvent and additives. Negative ones often consist of isoprene monomers. Yellow as a light is visible and won’t emit any unwanted UV radiation that could alter the shape of the resist. Oftentimes, this makes it a viable choice for this kind of operation.

1. *Explain each step of the photolithography process.*

A flowchart that labeled the general steps for this is laid out in the theory. It goes like this:

1. **Prime** – Discuss likelihood of features lifting during development
2. **Spin-coat and Bake** – Spin-coat resist and evaporate solvent by baking in a hot plate
3. **Expose** – Expose resist and generate the latent image
4. **Post-Exposure Bake** – Bake once more to improve performance (if necessary)
5. **Develop** – Develop the image and form a relief pattern
6. **Hardbake** – Improve the thermal stability of the pattern
7. *Briefly describe the exposure wavelengths that are used in photolithography. Why do we use shorter wavelengths in the industry?*

Typical photolithography exposure wavelengths vary between Far UV (100-290 nm) to Near UV (250-450 nm). Shorter wavelengths are used because it allows you to generate an increasing level of detail on smaller components, which is necessary as these devices continue to get smaller in the real world.

1. *What are safety hazards in this experiment? Briefly describe rules for prevention of these hazards.*

The biggest safety issue in this experiment is the exposure of UV light to the body, which can be detrimental to both the skin and the eyes. For this, it’s important to always wear safety glasses and to avoid direct eye contact with the UV source. Wearing sleeves to lab could also prevent future complications.