Final Examination

This exam should be answered individually and no contact with other classmates is allowed for the purpose of answering this test. It should be turn in any time before 10:00 am on June13th, and it should be sent via e-mail with the *SUBJECT: Final NMS2020*

# How do you explain from a thermodynamic point of view the Ostwald ripening phenomenon?

# A nanolayer of atoms are deposited through a chemical reaction on a flat surface and you are asked to develop a general deposition model considering that the reaction can be a first or second order. Assume that both cases are diffusion controlled, the reaction velocity constants (RVCs) are the same and the diffusion rate is X times that of the RVCs. Write the model and make a drawing (by hand) to depict the phenomenon.

# It was found that a soap solution film with an unknown constant thickness reflects the day light and the resulting reflection is blue with a wavelength of 475 nm. The refractive index of the soap solution is 1.4. What is the thickness of the film?

# You obtained a film of gold on a 1 cm2 silica wafer. The film is 10 nm thick and you are asked to produce gold nano dots:

### Write an algorithm of the calculations you must do in order to determine the number of nanodots

### Write the equations, indicating what terms are temperature and surface tension dependent

### Show the calculations of how many nanodots you will get.

### Determine de % of area the nanodots will have on the 1 cm2 silica wafer.

**Note:** Do not use the size of nanodots published in the literature to answer this question. However, you can use reported data for surface tension, density, etc.

# You are being interviewed by the CEO of the company Non-Gray Metals, and they asked you make a 3 slide power point presentation based on the paper: **“Laser coloration of metals in visual art and design”**. You should be very careful and need to be very professional on explaining the phenomenon that makes a metal to have different colors.

# Observe the surface of the gold nanoporous film given in the paper **“Localized surface plasmon resonance of nanoporous gold”**. How would you measure the surface tension and the morphology of the film?

# You want to start your own company on the fabrication of nano-porous membranes. You found the article: **“Nanoporous aluminum oxide membranes for biomedical micro hydraulic devices”** to get started but you want to create a membrane with less pore size dispersion. What factor would you alter to make the distribution narrower?