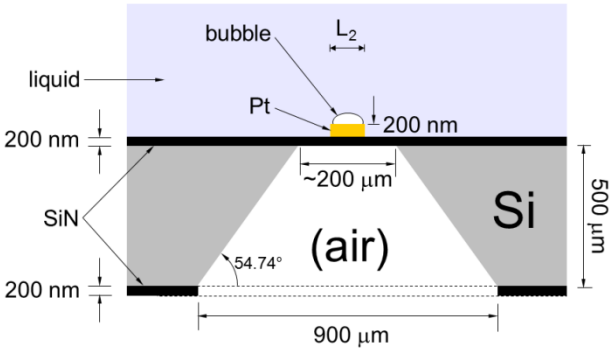
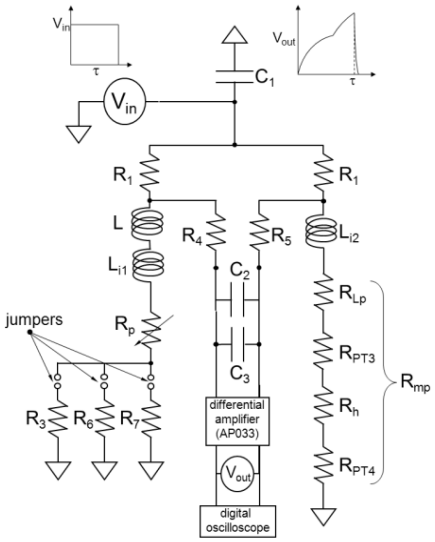
Design of a More Energy Efficient Ink Jet Printer

Some ink jet printers rely on bubble formation on microscale thin metal films to push ink through tiny nozzles aligned with the metal films to form ink droplets. The droplets are directed to paper to form print characters by programmed motion of the print head. This concept relies on rapidly heating the print head to nucleate an ink bubble, which requires energy that can be a critical concern in portable, battery-operated, printers.
The conventional design is for the print heads to be fabricated onto solid substrates. In this project the configuration to be investigated is a structure fabricated across an air gap that provides an insulating effect to heat flow, shown in the schematic below. Significantly less energy is anticipated to be required for nucleating bubbles compared to configurations with a solid in place of the air (the typical configuration).





The project will concern heating the metal films while immersed in various organic liquids to temperatures well above their normal boiling points. Detection of bubble formation is facilitated by making the microscale thin film heaters part of a "wheatstone bridge" with suitable electrical filtering to produce a clear response signal that can ultimately be related to average metal film temperature.
For this project, some familiarity with operating digital oscilloscopes, pulse generators and Labview, as well as a bit of circuits would be helpful (though not necessary).
For more information please contact Prof. C. Thomas Avedisian at cta2@cornell.edu [see http://www.mae.cornell.edu/mae/people/profile.cfm?netid=cta2 for relevant publications].