# ELECTRODEPOSITION OF NANOSTRUCTURED NIFE THIN FILMS

*Brief Introduction*

Electroplated Nickel-Iron alloys are used extensively in computer hard disk drives and other microelecromechanical systems (MEMS). Recent results have shown that the composition of NiFe is strongly dependent on the strength of flow during deposition. In this experiment you will be using a time-periodic flow field to generate layered deposits of varying Ni and Fe composition.

*Relevant introductory reading*

*J. Electrochem. Soc.* **146**, pp. 1431-1435 (1999).

*J. Electrochem. Soc.* **145**, pp. 2827-2833 (1998).

*Experiment*

You have access to a Pine bipotentiostat, computer, and rotating ring-disk electrodes. The basic idea is to electroplate NiFe on the disk electrode. After plating you put the electrode in a stripping solution and dissolve the deposit. Dissolved iron leaving the disk as $Fe^{+2}$ can be measured at the ring electrode ($Fe^{+2} \rightarrow Fe^{+3} + e^{-}$) to determine the amount of Fe in the deposit. Using these facilities, along with pre-made plating and stripping solution, you should first determine how steady rotation rates affect the composition of NiFe alloys plated at -20 mA/cm2. Then, you should try to make layered alloys by modulating the flow in a time-periodic fashion. Study a range of flow oscillation frequencies to determine the dependence of layer thickness on flow oscillation frequency. Your report should discuss these results and compare them with similar results published in the literature. Also make certain to consider the technological implications of your results.