

10.213 Homework  
9/29/99

**Problem 9 Due 10/4**

Gaseous HF is used in semiconductor processing to remove (etch)  $\text{SiO}_2$  producing fluorosilicic acid ( $\text{H}_2\text{SiF}_6$ ) and water adsorbed on the surface. At high concentrations, the fluorosilicic acid decomposes to produce  $\text{SiF}_4$  gas and HF. The water also evaporates so that an aqueous layer of fixed thickness coats the silicon oxide surfaces. Assume a reactor is loaded with wafers containing silicon oxide covered wafers and a flow of 50% HF and 50% Nitrogen is started and the process is allowed to proceed until steady state processing is achieved. Assuming that 0.01 mole/min of HF is used and in the reaction 10% of the HF is consumed.

- a) What is the composition of the exhaust stream?
- b) For a surface area of  $1 \text{ m}^2$  what is the etching rate (thickness/min) of the silicon oxide assuming that the silicon oxide is removed uniformly.