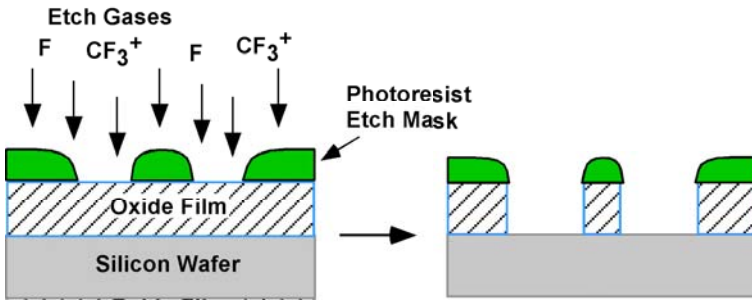


## (5) Etching



Drawing of silicon surface showing etching process, utilizing a photoresist mask, to remove oxide film from selected areas

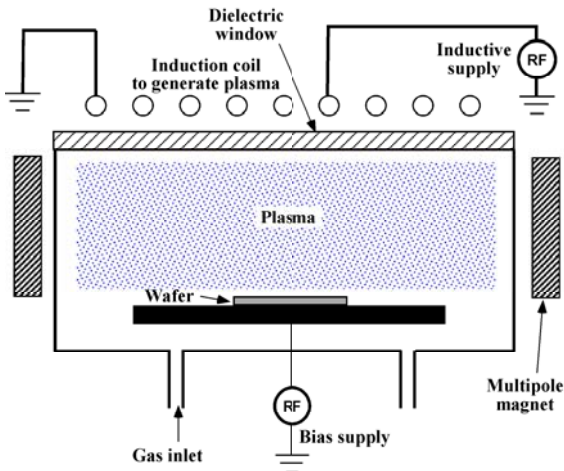


Diagram of plasma etch tool in which etching is done with energetic gaseous species and ions



A plasma etch tool in SNF

**Etching is used in nanofabrication processes to remove thin films on the wafer surface or parts of the wafer itself.** Gases or liquids are used which react with the surface material, creating byproduct species which either dissolve or vaporize away. Usually “masks” of photoresist or other material are used on top to prevent etching of the film in some areas, while allowing the etching to occur in others. This results in the film being patterned into the desired shapes.

**Etching can be done using liquid or “wet” chemicals, or by using gaseous or “dry” species. The latter usually utilizes a plasma** made up of energetic gaseous species, including free radicals and ions. The different species work together to provide the desired etching characteristics for a particular film, such as etch directionality and material selectivity. Plasma etching is especially useful for etching in a very uniform direction so that the mask pattern is precisely replicated in the film below.

**SNF has a variety of both wet and dry etch processes available.** The wet etching is done in the wet benches where wafer cleaning is also done, and uses chemicals such as hydrofluoric acid and potassium hydroxide. Numerous plasma etching tools, to etch a variety of materials, are in this area of the cleanroom, utilizing gases such as hydrogen bromide and sulfur hexafluoride.