Ion Beam Etching in Semiconductor Process

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Reactive ion etching with plasma has been used in semiconductor process for long time due to its anisotropic and fast etching characteristics. The sheath formed on the wafer surface accelerates the ions to the wafer in the vertical direction, which enables the fast and anisotropic etching. The distribution of the ions and radicals generated in the plasma can be controlled to obtain the suitable etching selectivity to the mask.

However, the sheath and the radicals play also undesired role. For example the electric field formed in the sheath enables only vertical etching to the wafers so it is hard to etch the wafers in arbitrary direction. Additionally, some etch byproducts aren't volatile and stick to the patterned sidewall, which can induce the electrical fail of the device, especially when the byproduct is conductive.

Recently, ion beam etching is considered to solve such problems. In this paper we introduce the ion beam etching for semiconductor fabrications including its properties and advantages compared to the RIE.