Poster MS38

Lithography using Diluted Alkaline Solutions: when Heat Replaces Chemicals

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The work presented here is a spinoff of our research on the reaction conditions to wet etch monocrystalline silicon in the subcritical region of water, specifically from 200 to 300°C. It focuses on the enhancement of the ability of alkaline solutions to dissolve silicon as temperature increases. The results of the study suggest that patterns can be transferred to silicon wafers by selecting the right etch masks and using concentrations of etching agent markedly lower than reported in previous works. Concentrations of KOH as low as 5.0×10^{-4} wt% produced etch rates comparable to those observed at atmospheric conditions using higher concentrations of etchants. These results have been attributed to the departure of thermodynamic, transport, and chemical properties of water in the subcritical region from those in normal conditions. This has the potential to affect the reactions paths for the dissolution of silicon, by modifying the local concentration of reactants and products, by altering the relative activation energy of different reactions, or by changing the polarity of water. The variables considered in our methodology were crystallographic orientation of the silicon wafers, temperature, and concentration of etchant.