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The results indicate that removal is enhanced by the use of SCl, which is expected since SC1 is well known to be an efficient particle removal chemistry. The ammonium hydroxide acts as a small-scale etchant for the silicon dioxide layer which is formed chemically by the hydrogen peroxide. Particles are undercut by this small-scale etching. The high pH of the solution also supplies a favorable electrokinetic environment for particle repulsion from the wafer surface, as discussed above. This repulsion works to minimize redeposition. Ultrasound enhances the effects of SC1 by increasing chemical reaction rates at the wafer surface [21].

5. Conclusion

Silicon wafer cleaning is already a critical technology in semiconductor manufacturing, and is becoming increasingly so as circuits decrease in size. Though very promising, sonic cleaning processes have not traditionally been well understood. This paper has attempted to elucidate some of the fundamentals of sonic removal of particles from surfaces through theory and experiment. Still, there is additional work to be done. Current research in sonic cleaning to further optimize operational parameters. Additionally, microroughening of Si wafer surfaces due to the small-scale etching behavior of SC1 solutions is an area of current concern, due to its deleterious effects on subsequently deposited films. Research to maximize cleaning while minimizing roughening is ongoing.

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