

Source Preparation: Cleaning

Introduction

A successful production of semiconductor devices requires that the silicon wafers, boats, paddles, tubes, etc. be carefully cleaned of all contaminants before they are used. Usually these materials are cleaned with one of the procedures that have become somewhat standard in the semiconductor industry. However, if the procedure is found to have a deleterious effect on the performance of the material, some alternate cleaning procedure must be used. This is the case for the PhosPlus sources.

This bulletin gives recommended procedures on how to clean the PhosPlus sources. It also gives cautions on alternate cleaning solutions and procedures that may harm the sources.

Cleaning Procedures

The PhosPlus sources are cleaned of processing contaminants before shipping. If additional cleaning is desired, however, the following procedure will etch away any foreign matter and will expose a pristine surface:

15 seconds dilute acid at room temperature in:

TP250 4:1 HNO₃

TP470 10:1 HF

2 minutes in DI Water #1

1 minutes in DI Water #2

60 minutes dry in a clean hood

Store in nitrogen

This procedure is only recommended for initial cleaning of the PhosPlus sources. After they have been used, a significant amount of the aluminum metaphosphate in the TP470 source has been converted to aluminum orthophosphate and the lanthanum pentaphosphate in the TP250 source has been converted to lanthanum metaphosphate. Since these products of the decomposition reactions are very soluble in acids, the acids could rapidly attack the sources and quickly disintegrate them. The higher the use temperature and the longer the source has been used, the more severe will be the attack on the source by the acid.

After the cleaning process is complete, the sources should be inserted into the diffusion furnace to begin the aging cycle using the procedures outlined in Product Bulletin 511. The aging cycle insures that the PhosPlus sources are evolving P₂O₅ at a uniform rate, that all moisture is vaporized and that any residual cutting and cleaning solutions are oxidized.

Conclusion

The PhosPlus sources must be cleaned of processing contaminants if optimum results are to be obtained. However, unless the proper cleaning solutions are used, the sources could be destroyed or their doping characteristics