Interactions of Moisture and Isopropanol with Low-k Dielectrics Films

Maria Leyva
Graduate students: Asad Iqbal and Jacky Yao
Professor: Farhang Shadman

Abstract

All of us, humans, utilize electronic devices on a daily basis. These devices result from the semiconductor industry. Consumers' demand for more sophisticated electronic devices has resulted in decreasing the size of these devices, along with reducing the size of chips up to the point of transitioning from micro-technology to nanotechnology. All of this has resulted in the need to develop new manufacturing process and materials for this industry. New materials include low-k dielectric films, which act as insulators on a chip. A study that involved the IPA interaction with low-k dielectric films was conducted. IPA, Isopropanol, was used because it is an organic compound that is highly used for cleaning in this industry. A Fourier transform infrared (FTIR) spectrometer was used. The focus of the project was to develop a repeatable procedure for the FTIR for this application. First, 5 one inch square coupons containing a low-K dielectric material are backed at 300 C for 48 hours and then inserted into a cell. Then the cell is purged the with Ultra high pure (UHP) nitrogen gas for two days. Impurities, in this case IPA, are feed into the system by bubbling UHP nitrogen gas through IPA. Scans were taken until the adsorption had reached steady state. Then the system was purged and scans were taken until the desorption had reached steady state. The peaks that were monitored at wavelengths from 2840 to 3020, clearly reflected the addition of IPA into the cell. Results showed that the rapid increase in IPA concentration is due to the concentration in the gas phase in the cell. The additional slow increase is due to the IPA that is being adsorbed on the surface of the coupons. This trend also applies to desorption phase. A moisture interaction with low-k dielectric films study, using a CRDS, was conducted. It was concluded that moisture adsorption increases significantly when heat is applied.