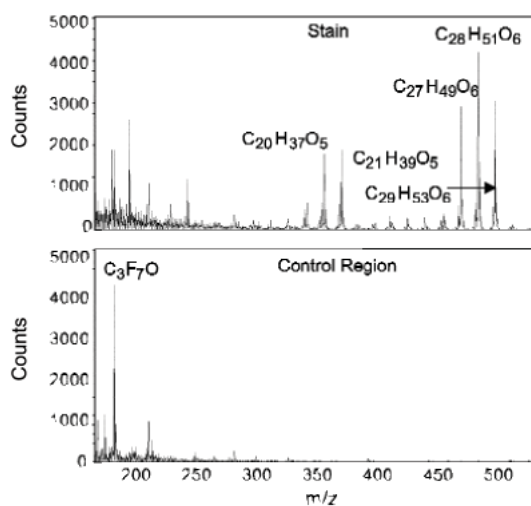
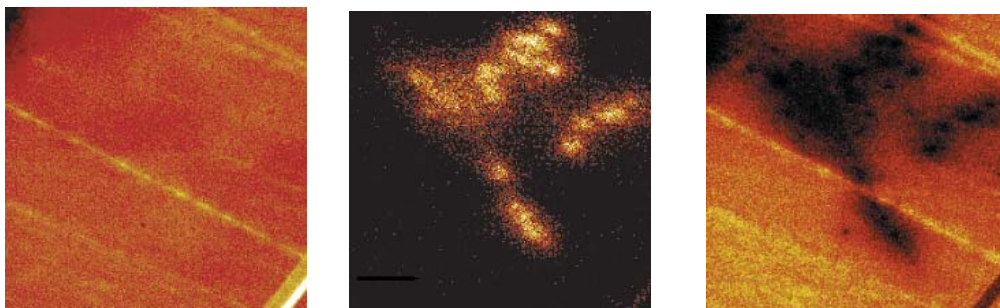


Discussion

As the performance of semiconductors, optoelectronic and photonic devices has improved, the tolerance for molecular contamination has decreased. The identification of organic contamination on surfaces has traditionally been attempted by several analytical techniques (FTIR, ESCA, and GC/MS). Time-of-Flight Secondary Ion Mass Spectrometry (TOF-SIMS) is an extremely surface sensitive analytical technique which can analyze both organic and inorganic contaminants at very low levels. TOF-SIMS can often identify an organic contaminant with or without the aid of reference materials. In the example below, droplets were observed optically on a surface at levels too low to be examined by FTIR (the individual droplets were $\sim 1\mu\text{m}$). TOF-SIMS analysis identified the contaminant as pentaerythritol tetraoctanoate ($\text{C}_{37}\text{H}_{68}\text{O}_8$), which is used as a machine lubricant.



The TOF-SIMS spectrum of the droplets showing peaks in the mass range from 320-500 daltons is shown in the top figure, while the bottom figure is from a control region on the surface. The droplets were determined to be pentaerythritol tetraoctanoate.



TOF-SIMS images showing, from left to right, the total ion image, the distribution of fluorolubricant, and a series of organic peaks in the range of 320-500 daltons. The mass spectrum from the droplets is shown above.

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