C60+ Secondary ion microscopy using a delay-line detector

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Buckminsterfullerene (C(60)) as a primary ion for secondary ion mass spectrometry (SIMS) has shown many benefits over classical SIMS sources in the analysis of large organic molecules including many of biological significance. One constraint has been the limited focusing capabilities of the C(60)(+) beam. Although this could be circumvented by using beam size limiting apertures at the cost of beam current, high-resolution imaging using conventional time-of-flight (TOF) instruments has been challenging and time-consuming. We present a method in which we combine the use of an unfocused C(60)(+) beam with an ion optical microscope. A delay line detector is used to obtain fully resolved hyperspectral data sets that contain both the full mass spectral and the localization information. The obtained image resolving power is 4 microm at a pixel size of 250 nm. Microscope mode C(60)(+) imaging was shown to resolve micrometer-scale features in a combined polymer-tissue sample. Our new approach demonstrates high-quality SIMS imaging using the full C(60)(+) beam current. This results in equal or better resolving power at reduced acquisition speed.

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