There are hundreds of chemical compounds that have been added to polymers to improve workability, performance and safety, including stabilizers, anti-oxidants, flame retardants, smoke suppressors, plasticizers, fillers, pigments, colorants, and processing additives. In all these compounds, there are numerous elements from boron to lead, 23 in all from an ASTM F40 draft guide for consumer polymers and several published papers. Whether or not these elements are regulated, indeed whether or not they are intentionally used in a particular polymer, it is necessary to include them in XRF test methods to get complete and accurate results. Although several companies and national metrology institutes (NMIs) offer reference materials for PVC, the elements and mass fraction ranges are limited compared to the realm of possibilities. As has been the case for NIST SRMs, somebody is always asking for different compositions. Development of numerous certified reference materials (CRMs) is not only remarkably expensive; the required time is prohibitive. Taking into consideration that one big reason for demand for more compositions is the need to calibrate test methods, it made sense to develop a simple method for preparing calibration standards in the laboratory. Such a method would enable every laboratory to create custom compositions for their own product slate. Rare and expensive CRMs from NMIs could be kept for their intended purpose of method validation. The procedures described in this presentation use common laboratory tools to make homogeneous PVC disks with accurately known mass fractions of up to 10 elements. There is no need to use compounding equipment. The sources of the elements are NIST SRM 3100 series single element solutions and water/dilute acid soluble pure compounds. These sources provide mass fraction values from low mg/kg to nearly 1 % that are traceable to the SI unit kilogram with low uncertainty estimates. The process also allows for customization of the amount of PVC and Cl content by adding polyethylene.

MicroXRF map of Pb in cross-section region highlighted red on ground disk surface.