For XRF the LOD was calculated as three times the SD of ten replicate blank measurements (bromine free ABS reference material), with the LOQ calculated as 10 times that SD.

Results

An optimised method for Br quantification as a metric of brominated flame retardant (BFR) concentrations present in Waist of Electric and Electronic Equipment (WEEE) polymers is proposed as an alternative to the sophisticated, yet time consuming GC-MS methods currently preferred. A hand-held X-ray fluorescence (XRF) spectrometer was validated with Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS). Customized standard materials of specific BFRs in a styrenic polymer were used in this study to perform an external calibration for hand-held XRF ranging from 0.08 to 12 weight % of Br cross-checking with LA-ICP-MS having similar LODs (0.0004 weight % for LA-ICP-MS and 0.0011 weight % for XRF). The "thickness calibration" developed in this study for hand-held XRF and the resulting correction was applied on 28 real samples and showed excellent ($R2=0.9926$) accordance with measurements obtained via LA-ICP-MS, confirming the validity of hand-held XRF as an accurate technique for the determination of Br in WEEE plastics. This is the first study reporting the use of solid standards for the development of a thickness-corrected quantitative XRF measurement of Br in polymers using LA-ICP-MS for method evaluation. Thermal desorption gas chromatography mass spectrometry (TD-GC-MS) was used to confirm the presence of specific BFRs in the WEEE polymer samples studied. We propose that expressing limit values for BFRs in waste materials in terms of Br rather than BFR concentration (based on a conservative assumption about the BFR present), presents a practical solution to the need for an accurate, yet rapid and inexpensive technique capable of monitoring compliance with limit values in situ.