

ABSTRACT

This work demonstrates the excellent performance of X-7600 to analyze carbon in ductile cast iron sample. The X-7600 is equipped with a highly sensitive silicon drift detector with a very thin detector window that allows for efficient detection of carbon in for example cast iron samples (between 2-4% of carbon).



ANALYTICAL CONFIGURATION

Table 1: Analytical Configuration of X-7600

Instrument	X-7600
Excitation	Rh-Anode X-ray Tube, 60KV 300W
Detector	Light element sensitive high performance Silicon Drift Detector (SDD)
Analysis Time	600 seconds
Environment	vacuum
Sample preparation	No sample preparation

EXPERIMENTAL

Qualitative analysis of carbon was performed on X-7600. Spectrum of different samples of varied Carbon content were used to confirm the presence of carbon, a very light element with a Ka peak at low energy (0.282keV) and used as standards to calibrate X-7600 for the carbon analysis. The analysis was performed in vacuum to avoid air absorption of the weak carbon signal.

RESULTS AND DISCUSSIONS

In **Figure 1** is shown the ductile cast iron sample. Typically these type of cast iron samples contain between 3.5-3.9% of carbon and 2.25-3% silicon, they also contain manganese, sulfur, phosphorous and sometimes magnesium. All these elements except Mn are clearly detected in the spectrum (acquired at voltage too low to detect Mn Ka or Fe Ka). The Fe La line is also present in the spectrum.

In **Figure 2** is shown the cast iron sample (red spectrum) overlapped by an iron alloy with 0% of carbon and by a black t sample with about 56% of carbon.

Figure 1: Spectrum of ductile cast iron alloy

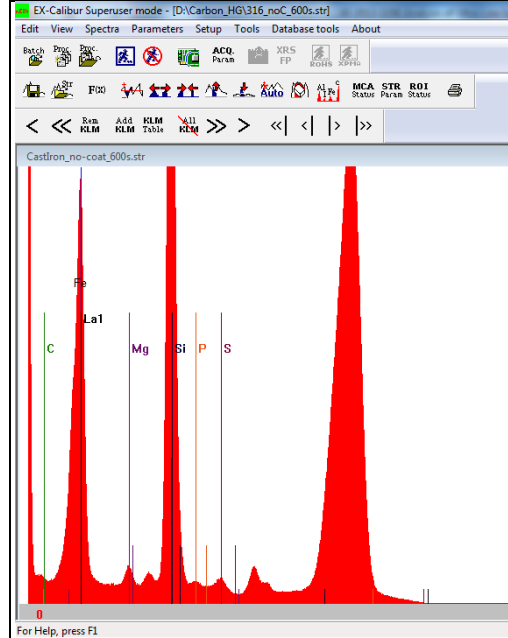
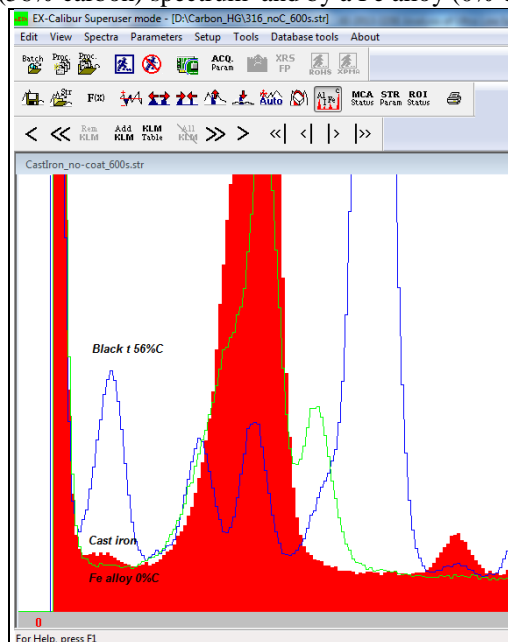
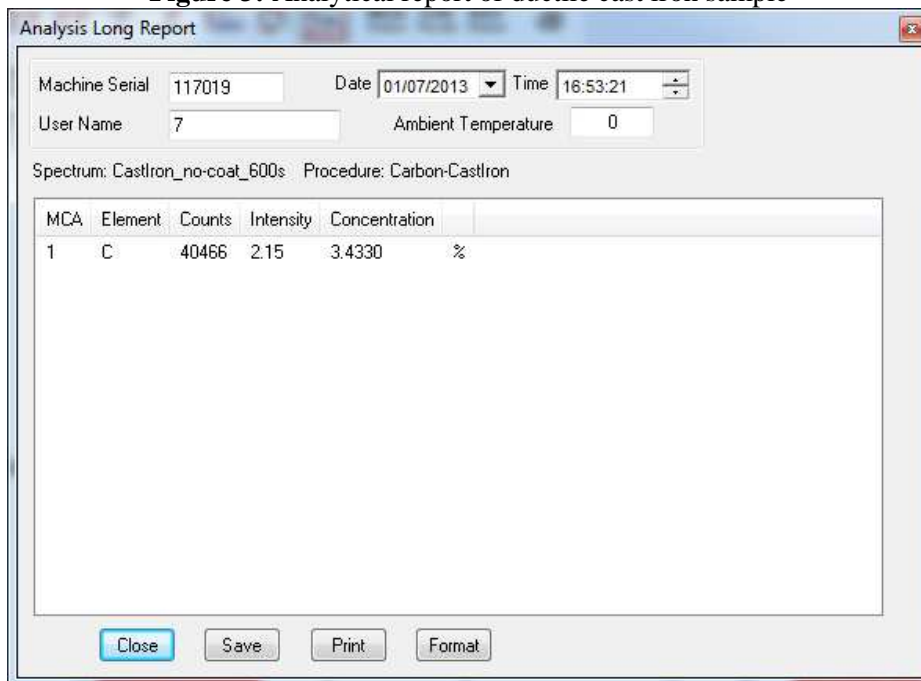


Figure 2: Spectrum of ductile cast iron sample overlapped by a Black t sample (56% carbon) spectrum and by a Fe alloy (0% carbon) spectrum.



To make a quantitative analysis of the ductile sample a two point calibration was built and the spectrum of the ductile cast iron sample was analyzed. The result 3.4% (w/w) was close to expected result of 3.3%. The analytical report is shown in **Figure 3**.

Figure 3: Analytical report of ductile cast iron sample



CONCLUSION

This report shows that X-7600 equipped with a specially light element sensitive SDD detector can efficiently be used to detect and to quantify carbon at low % (weight/weight). This makes it possible to perform quantitative analysis of carbon in many important applications such as for example carbon content in cast iron samples.