

# WDS Elemental Characterization of Stainless Steels using the HexLEXS

Parallax Research, Inc.  
Box 12212, Tallahassee, FL 32317  
phone: 850-580-5481 • fax: 850-668-4133  
www.parallax-x-ray.com • prlax@mindspring.com

The rapid elemental characterization of metal alloys is essential to a variety of fields ranging from process quality assurance to salvage. The composition of steels evades EDS characterization due to the overlapping  $K_{\alpha}$  &  $K_{\beta}$  lines of neighboring transition metals. In addition, the poor energy resolution of EDS ( $\sim 150$  eV) prevents the application of the lower energy L lines to analysis.

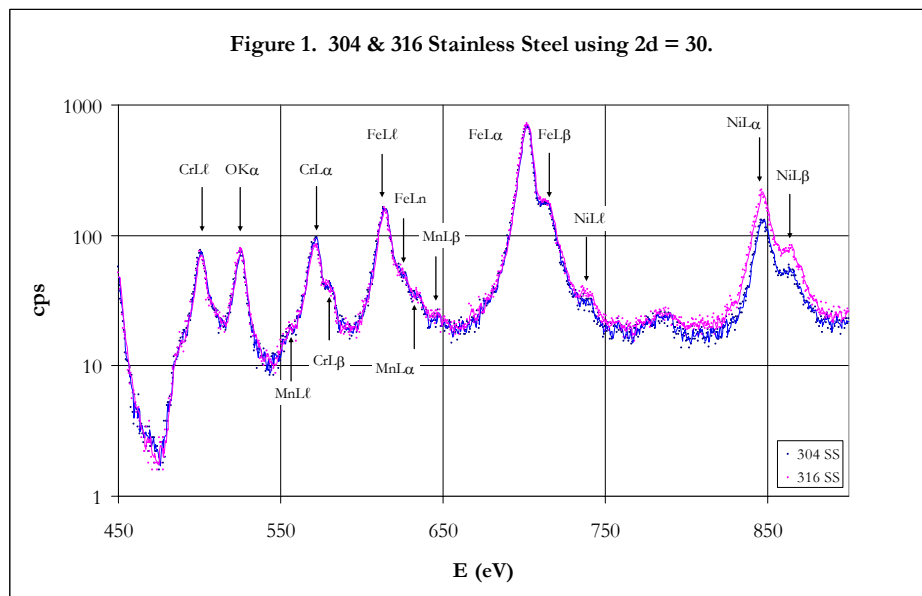
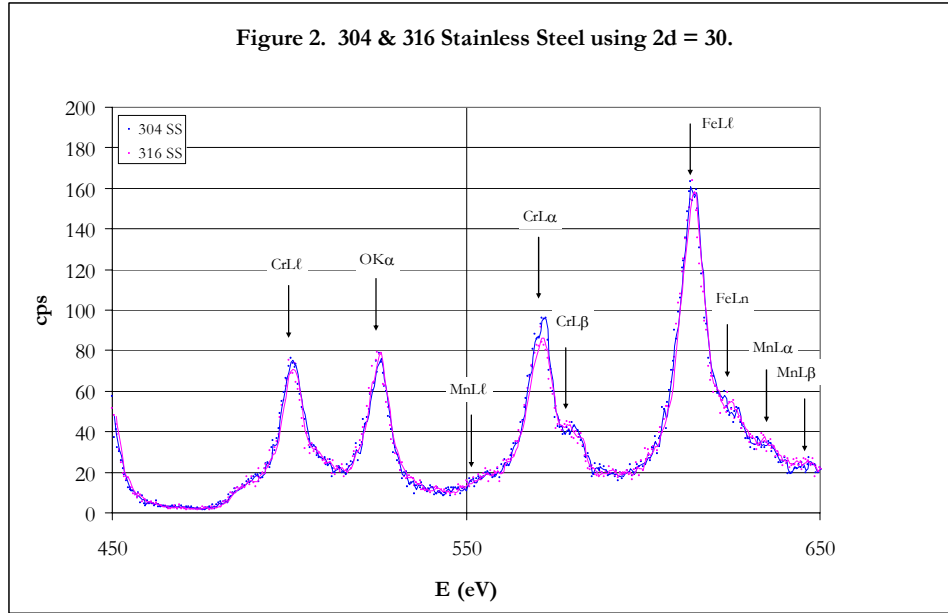


Figure 1 shows WDS spectral data taken on 304 and 316 stainless steels using the Parallax Research HexLEXS with  $2d = 30$ . Excitation source is 10kV electrons (50nA). Not only are the constituents of the stainless steel detectable from their  $L_{\alpha}$  lines, but **all of the associated spectral lines are resolvable** including the  $L_{\gamma}$  and  $L_{\eta}$  lines. The Ni richness of 316SS compared to 304SS ( $\sim 14$  %wt vs. 8-10.5 %wt) is evident in the Ni  $L_{\alpha}$ ,  $L_{\beta}$  and  $L_{\gamma}$  lines. The detectable Mn corresponds to  $\sim 2$  %wt.



*Figure 2* shows WDS spectral data taken on the same samples under the same conditions in the energy range of 450-650 eV. The Cr richness of the 304SS is clearly evident (20 %wt vs. 18 %wt) and the presence of Mn is clearly resolvable. The scan in *Figure 1* was configured to resolve the minor  $L_{\ell}$  and  $L_n$  lines and as such required 75 minutes. With L-line peak widths on the order of 8eV for  $2d = 30$ , the step size can be increased to  $\sim 1-2$  eV without reduction in energy resolution. In the case of quantitative analysis where only the strongest  $L_{\alpha}$  peaks are of interest, the dwell time can be reduced to 1s. *Figure 3* below shows data taken using the HexLEXS WDS in 7.5 minutes using  $2d = 30$ , and the corresponding energy range obtained by EDS in 5 minutes from 0-5kV. **The HexLEXS provides far superior energy resolution and peak-to-background for acquisition times comparable to EDS.**

