Low Energy Spectroscopy of VO_x: The HexLEXS Advantage

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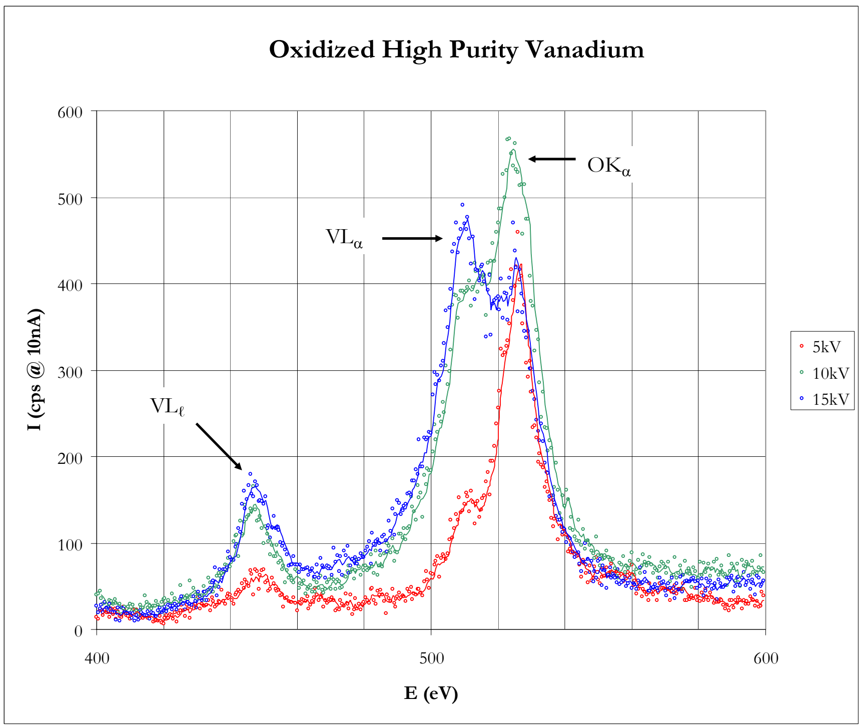
The poor energy resolution of EDS (~150eV) has limited much of its application to the K lines of transition metals. Even then the K_α and K_β peaks of neighboring transitions metals ($\Delta Z = \pm 1$) overlap, requiring deconvolution for analysis. One classic overlap is that of the V L_α (511 eV) and O K_α (525 eV).



The figure above shows the V L_α - O K_α spectral region of grossly corroded vanadium metal taken with 10 nA probe current at 5, 10 and 15 kV beam energy using 2d = 30 Å. The resolution of the HexLEXS data is ~ 10 eV compared to the ~ 150 eV resolution of EDS, allowing for the resolution of both the V L_α and O K_α peaks. This high energy resolution, in combination with the large effective collected solid angle of the HexLEXS optics, allow the application of L lines to the study of transition metals, including their oxides and alloys.

The use of low-energy L lines makes it possible to probe material surfaces by using smaller electron excitation energies. The 15 kV data above shows a V L_α peak larger than the O K_α peak—while the 5 kV data shows the V L_α peak dwarfed by the O K_α peak. This variation in relative peak heights with beam energy demonstrates the surface segregation of the O species.