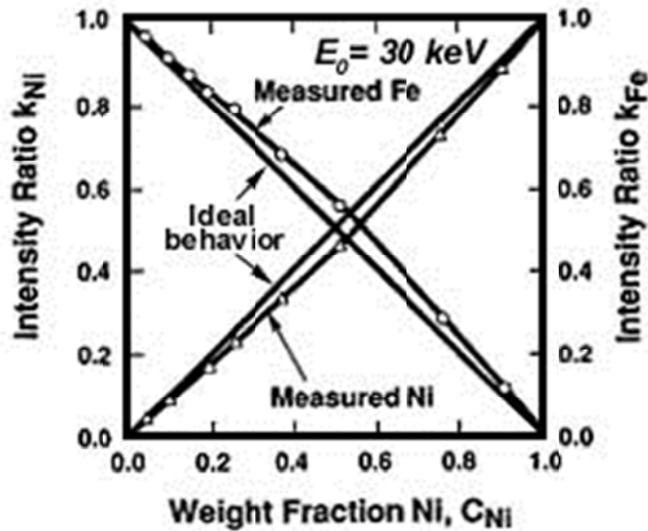


# Course 12.141: Electron Microprobe Analysis – Problem Set 4

NiK $\alpha$  ( $E_{K\alpha}=7.478$  keV) is highly absorbed in Fe ( $E_{c(K-shell)}=7.111$  keV) with  $(\mu/\rho)_{Fe}^{NiK\alpha}=379.6$  cm<sup>2</sup>/g. As a result, a positive correction is applied to the measured k-ratios of NiK $\alpha$  in Fe-Ni alloys. On the other hand, FeK $\alpha$  is fluoresced as a consequence of NiK $\alpha$  absorption. A negative correction is applied to the measured k-ratios of FeK $\alpha$ .



**Problem 4.1:** Use the average results obtained in Problem 3.1 to plot graphs of Z, A, F, and combined ZAF versus composition. Explain the variations in Z, A, F, and ZAF with composition.

**Problem 4.2:** In a single spot analysis, the measured k-ratios for FeK $\alpha$  and NiK $\alpha$  are 0.535 and 0.488 respectively. Use an iterative procedure to calculate the concentrations of Fe and Ni in the alloy.

The constants needed for the calculations are as follows:

	Fe	Ni
	FeK $\alpha$ =6.404 keV	NiK $\alpha$ =7.478 keV
Z	26	28
A (g/mole)	55.847	58.71
$E_{c(K-shell)}$ (keV)	7.111	8.332
$E_o$ (keV)	15	15
$(\mu/\rho)_i^{FeK\alpha}$ (cm <sup>2</sup> /g)	71.4	90
$(\mu/\rho)_i^{NiK\alpha}$ (cm <sup>2</sup> /g)	379.6	58.9
$\psi$ (°)	40	40
$\omega$ (K)	0.347	0.414
$(r-1)/r$	0.880	0.880
P	1.000	1.000

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