# A Comparison of Experimental EPMA Data and Monte Carlo Simulations

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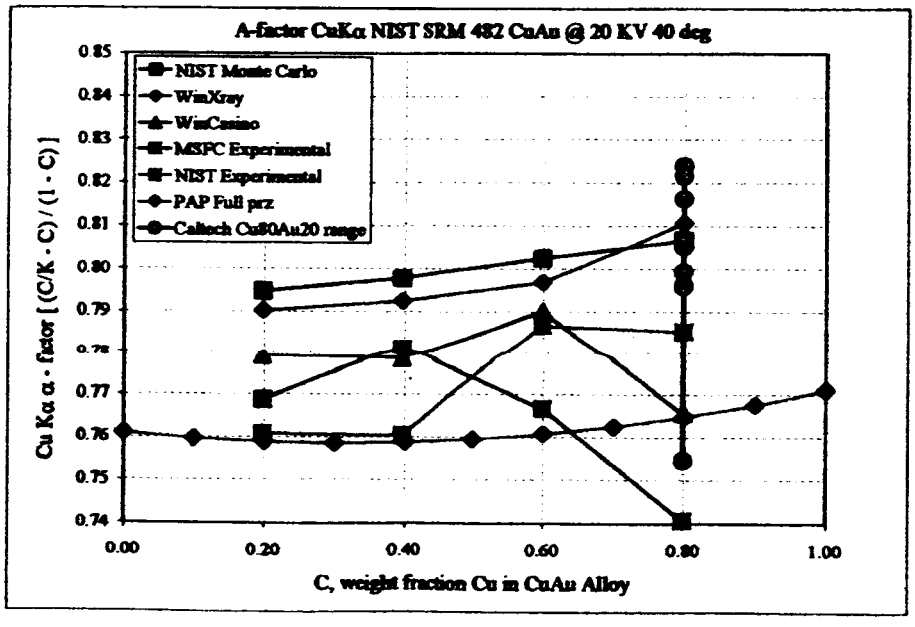
Monte Carlo (MC) modeling shows excellent prospects for simulating electron scattering and x-ray emission from complex geometries, and can be compared to experimental measurements using electron-probe microanalysis (EPMA) and $\phi(\rho z)$ correction algorithms. Experimental EPMA measurements made on NIST SRM 481 (AgAu) and 482 (CuAu) alloys, at a range of accelerating potential and instrument take-off angles, represent a formal microanalysis data set that has been used to develop $\phi(\rho z)$ correction algorithms. The accuracy of MC calculations obtained using the NIST, WinCasino, WinXray, and Penelope MC packages will be evaluated relative to these experimental data. The $\alpha$-factor method has previously been used to evaluate systematic errors in the analysis of semiconductor and silicate minerals [1,2,3], and will be used here to compare the accuracy of experimental and calculated x-ray data. X-ray intensities calculated by MC are used to generate $\alpha$-factors using the certificated compositions in the CuAu binary relative to pure Cu and Au standards. MC-generated x-ray intensities have a "built-in" atomic number correction, and are further corrected for absorption and characteristic and continuum fluorescence by $\phi(\rho z)$ correction algorithms. Preliminary results for $\alpha$-factor analysis of Cu K$\alpha$ in SRM 482 at 20 kV and 40 degree takeoff angle are shown in figure 1. For these data there is ~ 5% agreement between intensities calculated by MC and the PAP $\phi(\rho z)$ algorithm compared to experimental EPMA data acquired from three different instruments. This excellent agreement indicates that MC modeling can be successfully used to calculate x-ray intensities for quantitative EPMA.




## References

[1] P. Carpenter, Microbeam Analysis (2000), 433.

[2] P. Carpenter, Microscopy and Microanalysis (1999), 74.

[3] P. Carpenter, J. Armstrong, Microscopy and Microanalysis (1998), 224.