

ICP-OES Interference Maxims

- Interference correction can be accomplished using inter-element correction (IEC) factors, or commercial software algorithms** including Perkin-Elmer's MSF (Multi-component Spectral Fitting), and Varian/Agilent's FACT (Fast Automated Curve-fitting Technique and Fitted Background Correction systems).
- Interference correction is not mandatory.**
 - Labs can choose not to employ any correction, but must be able to demonstrate that routine samples analyzed (based on levels of contaminants encountered) do not interfere.
 - Certainly some samples could be run without using interference correction. An example would be finished municipal drinking water which is expected to contain little of anything, even common cations (except, perhaps, sodium).
- Checking for interferences, initially**, and whenever any major change is made to the instrument, **IS mandatory**. Annual re-evaluation is required (if not done for reasons below).
 - Major changes to the instrument configuration which require re-evaluation of interferences include changes to nebulizer, spray chamber, torch, plasma optimization, and background correction points
- So, basically **be prepared to show an auditor what interference correction you use** (and how it was determined) **OR data that conclusively demonstrates that interference correction is not required** for standard elements identified in reference methods.
- DO NOT limit the single element standards analyzed to merely the analytes you plan to report.** You must analyze at least single element standards for the main 30 analytes listed in 200.7.
- Choose levels for single element standards that represent the range of samples you anticipate encountering.** Your IECs are invalid above this level and must be repeated.
- Interference correction, like with LDR, is only valid for a given interferent at levels up to the single element level tested.** If you encounter an interferent at a level above the concentration of single element standard at which you tested for interference, you **MUST** repeat the determination using a single element standard concentration level at least equal to that in the unknown sample (OR dilute the sample till the interferent is below the tested level).
- Design and prepare calibration standard mixes carefully.** It is generally not advisable to put two elements that interfere with each other in the same standard. This can wreak havoc with your attempts to determine interference corrections.
- Hint, Hint: There's a reason why 200.7, 6010, and 3120B all specifically indicate FIVE (5) standard mixes.**
- Be aware that **trace contaminants in single elements standards can also pose a problem.** Check your standard certificates for possible contaminants and levels and verify that no potential interference is present. It can...and has...happened.
- When analyzing single element standards** to evaluate interferences, either any interference correction factors in the **IEC table must be wiped clean or interference correction MUST be toggled OFF.** Failing to do so can put you in a never-ending loop.
- While you may not observe the need for correction on an interferent at X ppm, any higher level of interferent may suddenly result in interference from the peak or peak edges.

Example: *if you established your IECs for Mo at 2 ppm, a sample containing 17 ppm Mo will be a problem. You need to go back and re-check interferences at or above the level(s) you encounter in a sample.*

13. **Size does not matter.** Your instrument may be equipped with an extensive focal length, but that will not guarantee freedom from interferences.
14. **Greater resolution is not the answer either.** Better resolution may reduce the impact of neighboring interferences, but it is useless when facing direct spectral overlap.
15. **Interference correction is not a substitute for internal standard correction in the face of a complex matrix.** Our “real world” sample is a perfect example of this tenet. Internal standard correction was particularly critical due to the matrix.
16. Except for samples containing excessive levels of ionizing elements (major cations), **spectral interferences are positive in nature (they add to intensity)** and must be corrected by subtraction (a negative IEC). Negative corrections (in which case adjustment is made to add to the signal intensity) are typically caused by raised baseline (from interferences) which impacts background correction points.
17. **There is absolutely no need to analyze an “ICS-AB” sample (Major cations plus all other target analytes at about 1 ppm).** This sample was ONLY required back in the 80’s when older instruments could not read negative values. Trust us...you don’t have one of those.
18. Interference check standard (ICS) samples should consist of:
 - a. An ICS-A, which contains major interferent cations (Al, Ca, Fe, Mg) at levels routinely encountered (250-500 ppm).
 - b. Secondary ICS samples should include one or more of the secondary interferences (at least: Be, Ba, Cd, Ce, Co, Cr, Cu, Mn, Mo, Ni, Si, Sn, Ti, Tl, V) at levels one might reasonably encounter, such as 10 ppm.
 - c. You may need to separate secondary interferences into ICS-B and ICS-C (C? D?) samples if these analytes interfere with each other.
19. **Evaluation of ICS sample results is done by (1) evaluating results of interferences and (2) evaluation of target analytes NOT present in the sample.** Comparison of unspiked analytes should be made relative to an initial calibration blank (ICB).
 - a. Target analytes not present in the ICS should not be observed at levels significantly different than that of a blank.
 - b. One needs to assess for both overly positive results (spectral enhancement of signal) AND overly negative results (caused by over-correction by an IEC or by an affected background correction point).
 - c. Using the LOD as an absolute +/- maximum, while optimal, may pose challenges and result in an exhaustively iterative determination of IECs.
 - d. Using the LOQ as an absolute assessment maximum (+/-) may be too high when determinations close to the LOD are required. Use of a “reporting limit” is not OK.
 - e. Therefore, using +/- 2XLOD as a criterion for determining the presence of an interference is a reasonable compromise.
20. **The use of alternate wavelengths can be an invaluable resource for identifying interference at the primary wavelength.** If results for the two wavelengths do not agree, one (or both) of the lines is being interfered with.