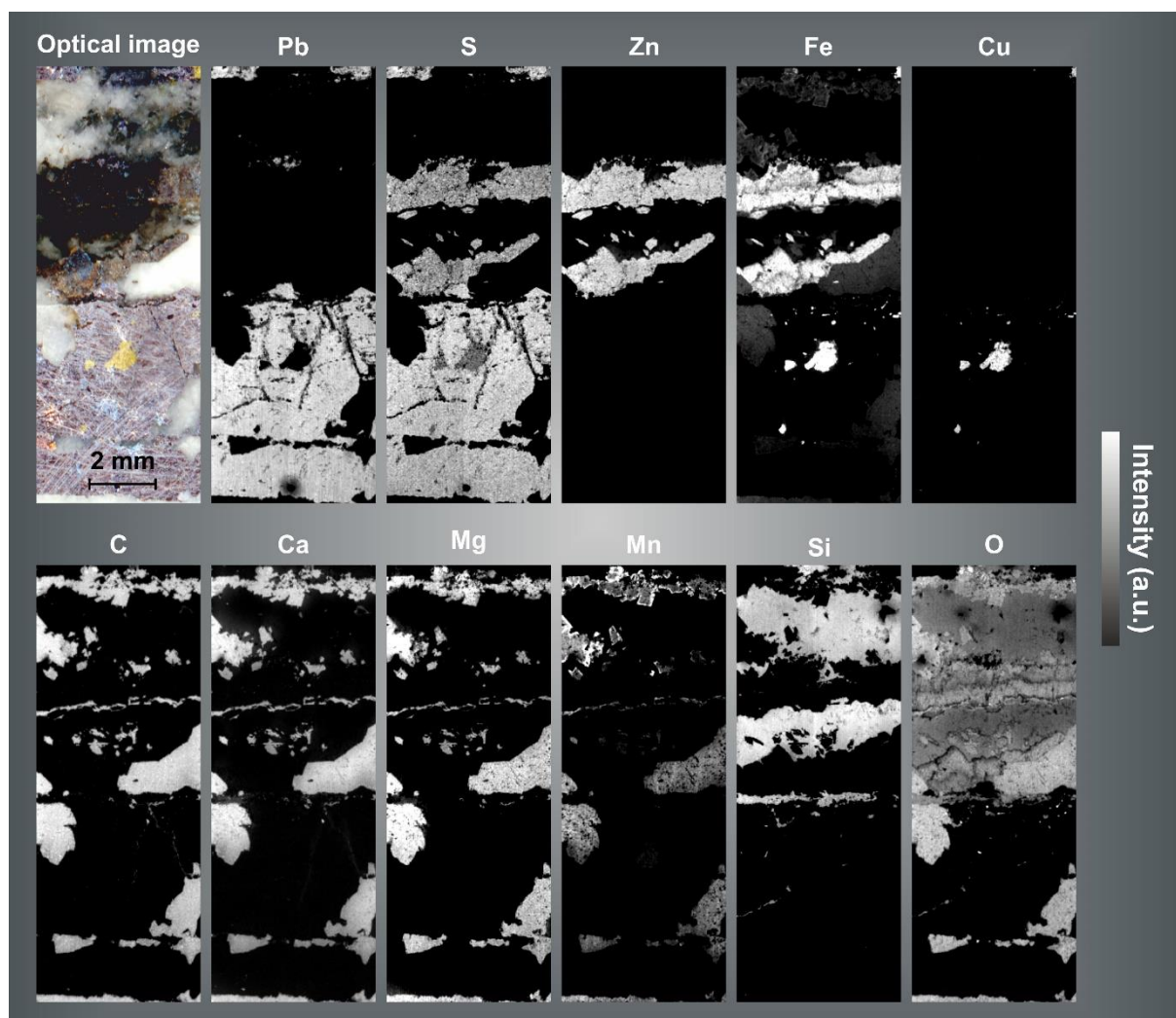


### Supplementary Material

**Supplementary Figure 1:** Example of LIBS images performed with the 10Hz system allowing the detection of sulfur (180.731 nm) and oxygen (777.194 nm). Same emission lines has been used for other elements (c.f. supplementary table 1).



**Supplementary Table 1:** Detected lines.

Phase	Element	Position (nm)
Carbonates	C I	193.0905
	Mn II	259.3724
	Mg I	285.2126
	Fe I	302.0639
	Mo I	313.2594
	Ca II	315.8869
	Y II	332.7878
	La II	333.7486
Chalcopyrite	Fe II	259.9396
	Sn I	317.5035
	Cu I	327.3960
Galena	Pb I	283.3053
	Fe I	302.0639
	Sb I	302.9834
	Bi I	306.7707
	Cu I	324.7537
	Ag I	328.0679
Quartz	Mg I	285.2126
	Si I	288.1578
	Fe I	302.0639
	Al I	308.2153
	Be II	313.042
	Ca II	315.8869
Sphalerite	Zn II	202.5483
	Cd II	226.5019
	Fe I	302.0639
	Cu I	324.7537
Others	Ni I	313.4101
	As I	286.0438
	Zr II	267.8646
	Ti II	334.9408
	P I	213.6182

**Supplementary Figure 3:** Estimation of the plasma parameters by comparing experimental and simulated spectra. The chosen experimental spectrum corresponds to a single shot acquisition performed on the sphalerite phase, containing low concentration of iron. Note that the electron density has been determined from the H $\alpha$  line (results not shown). The plasma temperature was then obtained by a manual adjustment of the Fe simulation spectrum. This adjustment was conducted with the idea to obtain a good intensity levels from atomic and ionic lines of iron. The resolution power (RP) as well as the background noise ( $\sigma$ ) are also indicated. Note that a background value of 190 has been added to the simulated spectrum.

