EPR STUDY OF PALEOGENE TO PRECAMBRIAN CHERTS: REASSESSING THE USE OF EPR FOR THE DETECTION OF CONTAMINATIONS IN VERY OLD CARBONACEOUS MATTER. M. Bourbin[1], S. Derenne[1], D. Gourier[2], Y. Le Du[2] and F. Westall[3], [1]Bioemco, Paris, France (corresponding author mathilde.bourbin@upmc.fr), [2]LCMCP, Paris, France, [3]CBM, Orléans, France.

The most ancient Life traces, as old as about 3.5 Gyr are recorded in siliceous sedimentary structures (cherts). If the mineral matrix may be accurately dated, using the U-Pb isotope scale notably, the dating of the organic matter (OM) embedded in the mineral matrix remains a difficult task. Indeed, OM may be more recent than the mineral matrix, due to various contamination processes (weathering, colonization by endolithic bacteria, anthropogenic contamination...). It is therefore of utmost interest to find syngeneity markers, establishing that the organic matter does not result from any contamination process and is of the same age than the mineral matrix.

Electron Paramagnetic Resonance (EPR) spectroscopy is a high sensitivity technique for the study of organic radicals in mature geological samples containing organic matter (coals, cherts, flints, meteorites…). The evolution of the shape of the EPR line was recently proposed as a proxy for syngeneity in cherts having a metamorphism level lower or equal to greenschist [1]. The EPR line namely evolved from a gaussian (for recent samples) to a lorentzian shape (for ca. 2Gyr old samples), ultimately reaching a "stretched-lorentzian" shape (for ca. 3.5Gyr old samples). This evolution reflects the change from a 3D to a 2D distribution of the radicals in the organic matter of the chert.

In order to test the reliability of this proxy, a wide set of chert samples was studied, ranging from the Paleogene to the Precambrian, and showing various metamorphic grades. EPR line shape of all samples was in agreement with chert age, and the proxy was established as statistically robust.

Importantly, EPR study of chert samples having same age but various metamorphism grades (but still lower or equal to greenschist) shows that metamorphism does not rule the evolution of the EPR line shape.

Moreover, to test the resolution of this syngeneity marker, artificially contaminated material was studied, revealing that EPR may detect contamination with a good resolution in time. A methodology for contamination detection is therefore proposed.

This study enhances that EPR is a powerful tool for the study of the OM in very ancient cherts, and that it can be extended to further exobiology studies.

References:

[1] Skrzypczak-Bonduelle A. et al. (2008) *Appl. Magn. Reson*., 33, 371-397.