Pathologists never report the presence of a possible metal-related aetiology in a specimen by lack of available technology. Therefore, several respiratory diseases are considered idiopathic. We recently developed an all-optical method, fully compatible with standard microscopy systems, for multi-elemental imaging of biological tissues.

**Methods**

Our instrument is based on Laser Induced Breakdown Spectroscopy (LIBS) and allows the in-situ imaging and quantification of the elements of the periodic table within biological tissues. A laser is focused on the sample surface. Elemental images (maps) are obtained by scanning the surface of the specimen. Spectrometers collect the signal of various elements such as Fe-Ca-Na-P-Mg-Zn-Al-Mn-Co-Si-Cr-Ti and Cu in the tissue.

**Results**

We identified and mapped the presence of high levels of Si and Al, but also Ti, or Cr in lung and mediastinal lymph nodes biopsies from exposed workers suffering from sarcoidosis or idiopathic pulmonary fibrosis. We found different elements including Lithium in the lymph node of a sarcoidosis patient working in a lithium-battery factory. We were also able to image the presence of Beryllium in the lungs of a patient with Chronic Beryllium Disease. As a matter of fact, Lithium and Beryllium are light-weight elements not detectable by any other elemental imaging technique. We will describe a panel of recent results obtained with LIBS, and confirmed with electron microscopy, focusing on respiratory diseases.

**Discussion**

This laser spectrometry technique is versatile because almost any element can be imaged with high sensitivity. These results demonstrate the strong potential of this disruptive technology as a complementary tool for routine classical in-situ pathology examination of human tissues embedded in paraffin, especially for idiopathic respiratory diseases related to occupational or environmental exposure to metals, dust, or particles.