Creation of Quartz ID cards for source tracing using a multi-method approach as part of the ANR Quartz project: Lithium as a key element
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Quartz, because of its high resistance to weathering, is ubiquitous and abundant in fluviatile sediments. Its chemistry and physical properties provide information on its formation context and subsequent history making it an interesting marker of fluvial dynamics in a source to sink approach.

One of the main objectives of the French ANR Quartz project is to use the characteristics of quartz to trace its origin within fluvial sediments by combining conventional characterization methods with dosimetric methods such as Electronic Spin Resonance (ESR) and Optically stimulated luminescence (OSL) usually used for dating.

The first step to this is the characterization of the quartz signature of each of the bedrocks of the watershed of interest.

**The Strengbach Watershed:**
The Strengbach is a small river from the Vosges Moutains (France). It has a relatively small catchment (ca. 40 km²) with a relatively simple bedrock lithology.

**Quartz**

- **Grainstone**
- **Carbonate grainstone - y/c**
- **Thermokarst grainstone - y/b**
- **Biotite grainstone - y/d**

**Gneiss**

- **Gneiss**

**Sandstone**

- **Volcanic sandstone**
- **Burtle sandstone**
- **Unfed sandstone**

**Lithium in quartz:**

Ideal quartz structure is network of SiO₄ tetrahedra linked together by their oxygen atoms.

Tetrahedra are arranged in helicoidal structures that create channels parallel to the crystallographic c-axis.

Some of the most common defects of the quartz lattice are atom vacancies and Si substitution.

Common substituting atoms in quartz: Al, Ti, Ge.

Vacancies and substituting atoms may require a charge compensation to keep electronic neutrality.

This role is taken by foreign cation circulating through the quartz structure in the c-axis channels.

Li is a common charge compensating ion. As such, it contributes to one of the main ESR centers used for dating.

The best correlation between OSL and ESR signals is obtained with the Ti-Li center intensities. However, there is no relation between the OSL signal and Li.

The same sample families observed using elemental analyses can be retrieved.

A lot more to do:
- **LIBS data**
- **Spectral CL data to acquire and treat**
- **Statistical treatment (ACP)**
- **Identify trace elements responsible for OSL and ESR signal**
- **Application to Strengbach fluvial sediments for provenance study**