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Increasing resource efficiency through continuous monitoring from exploration to processing

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A NEW HYPERSPECTRAL LIBRARY CONNECTED TO SOLSA OPEN DATABASES for on-line-real-time analyses of Ni laterites and Bauxite

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What is your preferred presentation method?: Oral or poster presentation

: The EU-H2020 SOLSA project (www.solsa-mining.eu), targets to construct an expert system coupling sonic drilling with an on-line-real-time analytical system combining systematic mineralogical and chemical analyses on drill cores to speed up exploration and mining. SOLSA will be tested on bauxite, and validated for Nickel laterites representing 70% of the Ni resources worldwide. The analytical system comprises a profilometer, a high resolution RGB camera, a XRF spectrometer and VNIR/SWIR (Specim, Finland) hyperspectral cameras. The objective is to reach real-time decision making through scanning of about 80 m drill cores per working day.

In addition to using the existing Crystallography Open Database (http://www.crystallography.net/cod/), SOLSA will provide new open databases for combined analyses. All samples are analyzed by conventional laboratory analyses (XRD, Raman spectroscopy, IR, SEM, EPMA and QEMSCAN®). A Raman Open Database with Raman spectra of certified standard samples has been recently constructed. A hyperspectral library containing spectra of pure minerals is being built for bauxite and Ni laterites for the major facies and minerals. It will be integrated into the underdeveloped software, enabling to determine regions of interests in drill cores for mining and definition of ore processing parameters. The library will be published as a hyperspectral open database at https://solsa.crystallography.net/sod/index.php. Furthermore, for every sample, an identity card is created and connected to a mineral open database (SOLSA ID card). The SOLSA ID cards contain information of the geological-mine context and results of laboratory analyses with macroscopic and microscopic photographs.

As the spectra from hyperspectral cameras of drill cores mainly exhibit mixtures of minerals, sparse unmixing techniques are implemented with the integration of our new hyperspectral library. Sparse unmixing techniques, achieving great success in remote sensing applications, aim at finding the optimal subset of signatures in a spectral library that can best model each mixed spectrum of a pixel. The methods exploit the fact that a spectrum always contains a mixture of a small number of endmembers, which is the case in bauxite and Ni-laterite. Among investigated unmixing methods, the collaborative sparse unmixing by variable splitting and augmented Lagrangian (CLSUnSAL) method provided the most accurate unmixing results on simulated data that were generated from our hyperspectral library. A polished serpentinized harzburgite sample, first analyzed by QEMSCAN®, was processed by the CLSUnSAL method. A good mineralogical correlation was found between results of the two techniques. These results will be cross-evaluated with Raman spectroscopy mapping.

References:

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