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Lithium (Li) mineral characterization of drill cores from the Alijó Project, Portugal

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Hard-rock lithium exploration requires integrating geological and geochemical data across multiple scales, from field-based 3D and 4D interpretations to laboratory imaging and analytical techniques. Accurate identification of lithium-bearing minerals, their distribution, and relationships with gangue minerals is essential for evaluating deposit economics and selecting appropriate processing methods. The combined use of micro-XRF and Automated Mineralogy (AMICS) enables rapid, high-resolution, non-destructive characterization of lithium-bearing minerals in minimally prepared drill core samples. This approach delivers valuable mineralogical information early in the exploration cycle, supporting resource evaluation and development planning. This case study presents the mineralogical characterization of selected drill core samples from AMG Lithium's Alijó Project, Portugal.

AMG Lithium is developing a vertically integrated Brazil - EU lithium value chain, anchored by its operating Mibra Li-Ta-Sn-Fsp mine in Brazil and lithium hydroxide refinery at Bitterfeld in Germany. Through its partnership with Grupo Lagoa, AMG is advancing the Alijó Project in northern Portugal as the next development in this strategy (Figure 1). Alijó and Barroso lie within the Barroso–Alvão lithium pegmatite province, part of the European Variscan Belt. The province comprises numerous aplite - pegmatite bodies associated with peraluminous two mica granites and emplaced predominantly within Silurian metasedimentary rocks. Spodumene rich, petalite rich and barren pegmatites occur intermixed, with no apparent local or regional zonation. The province's lithium potential is demonstrated by Barroso's JORC Mineral Resource Estimate of 39.2 Mt at 1.05% Li_2O, inclusive of a Probable Ore Reserve of 20.0 Mt at 0.99% Li_2O. The Alijó Project is located immediately east of Barroso. AMG's drilling programme has to date delineated a main pegmatite body 15–45 m wide, striking NNW–SSE (336° azimuth) and dipping approximately 70° southwest, over a strike length of 620 m and to a depth of 370 m below surface (Figure 4).

The Alijó pegmatite comprises microcline, albite, spodumene, muscovite and quartz, with accessory tourmaline, phosphates, eucryptite, beryl, cookeite and columbite-group minerals. Spodumene is the principal lithium-bearing mineral and is reported in economically significant quantities, occurring as crystals ranging from millimetre scale to more than 10 cm long. Its grain size distribution, liberation and gangue mineral relationships are key considerations for mineral liberation, beneficiation and process design, and will inform assessment of the proposed spodumene recovery route. Micro-XRF is ideal for first-phase understanding of the samples and observing overall textures as well as identifying numerous Li-bearing mineral phase and back-calculating Li-grade. Compositional and mineralogical mapping results highlight the value of micro-XRF and AMICS in improving mineralogical and textural understanding, providing enhanced geometallurgical insights that support more informed exploration and project development decisions.

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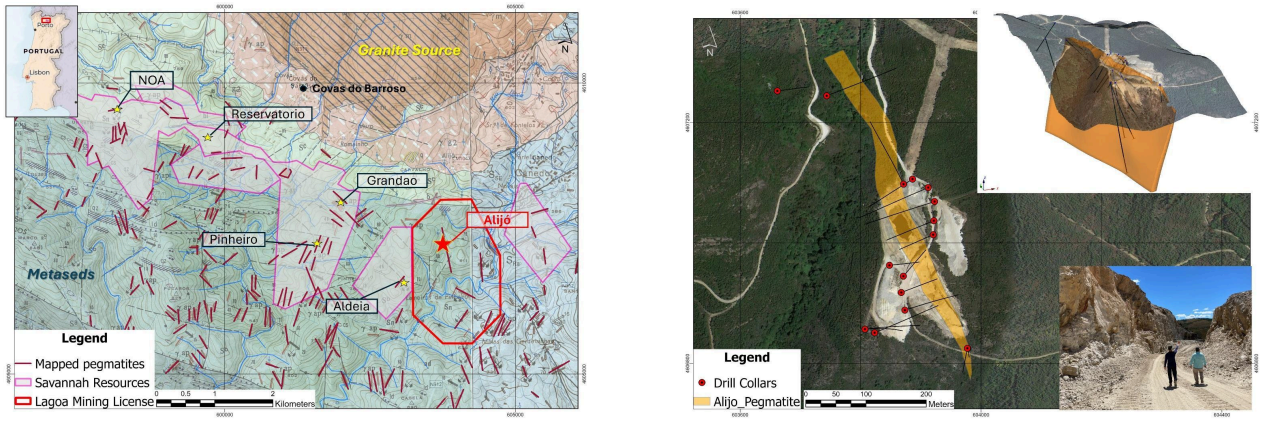

Figure 1. (a) Geological Setting of the Alijó Project, including Savannah Resources' Barroso Project (b) Alijó Pegmatite showing drilling, including 3D view of pegmatite.

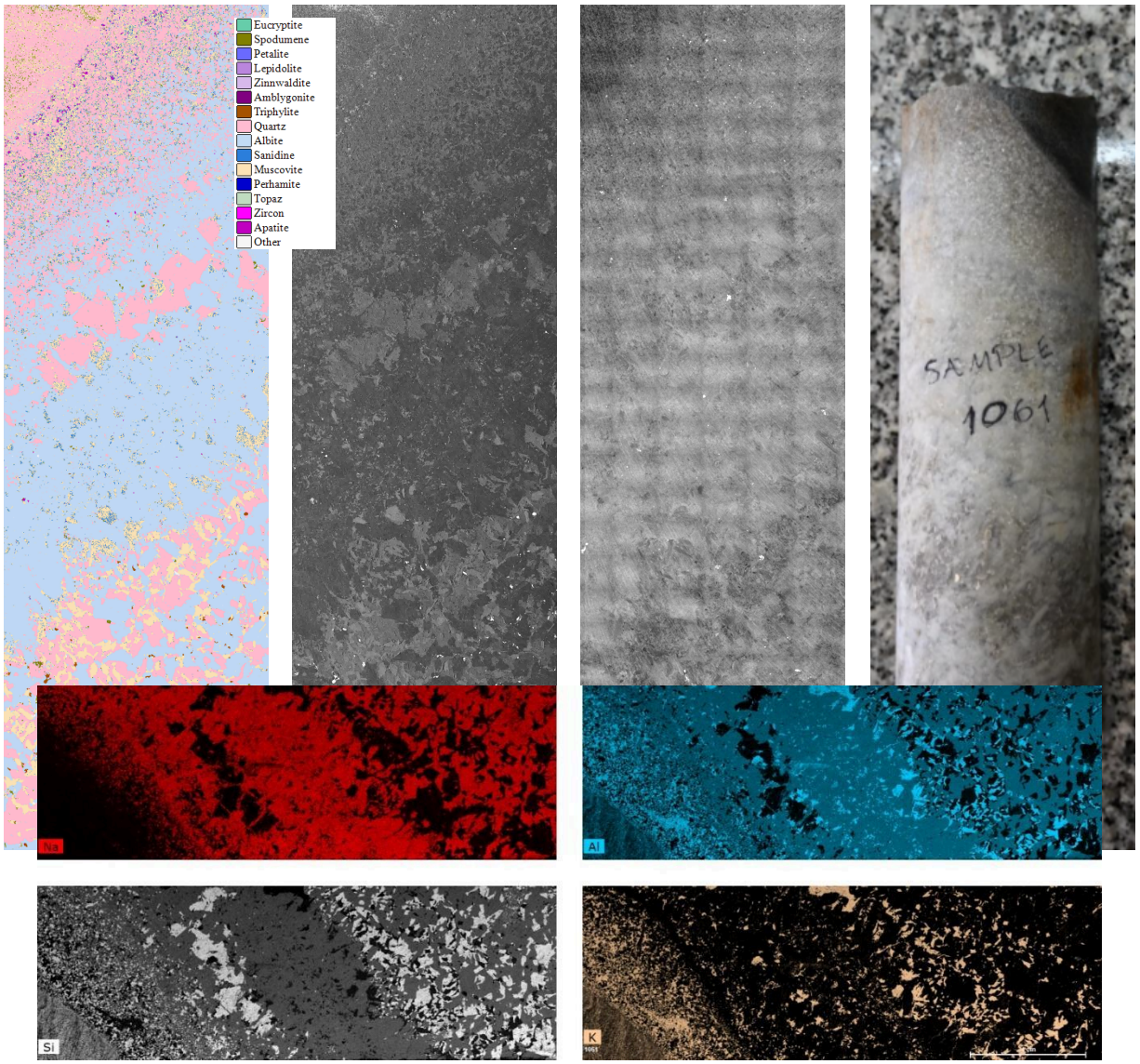

Figure 2. This image compilation shows: (a) Row 1: Mineralogy, Total X-ray Intensity, Optical image of the analytical flat surface, and Optical image of the sample (curved surface). (b) Elemental maps of various elements, namely: sodium (Na) in red; aluminium (Al) in blue, silicon (Si) in white, and potassium (K) in straw.

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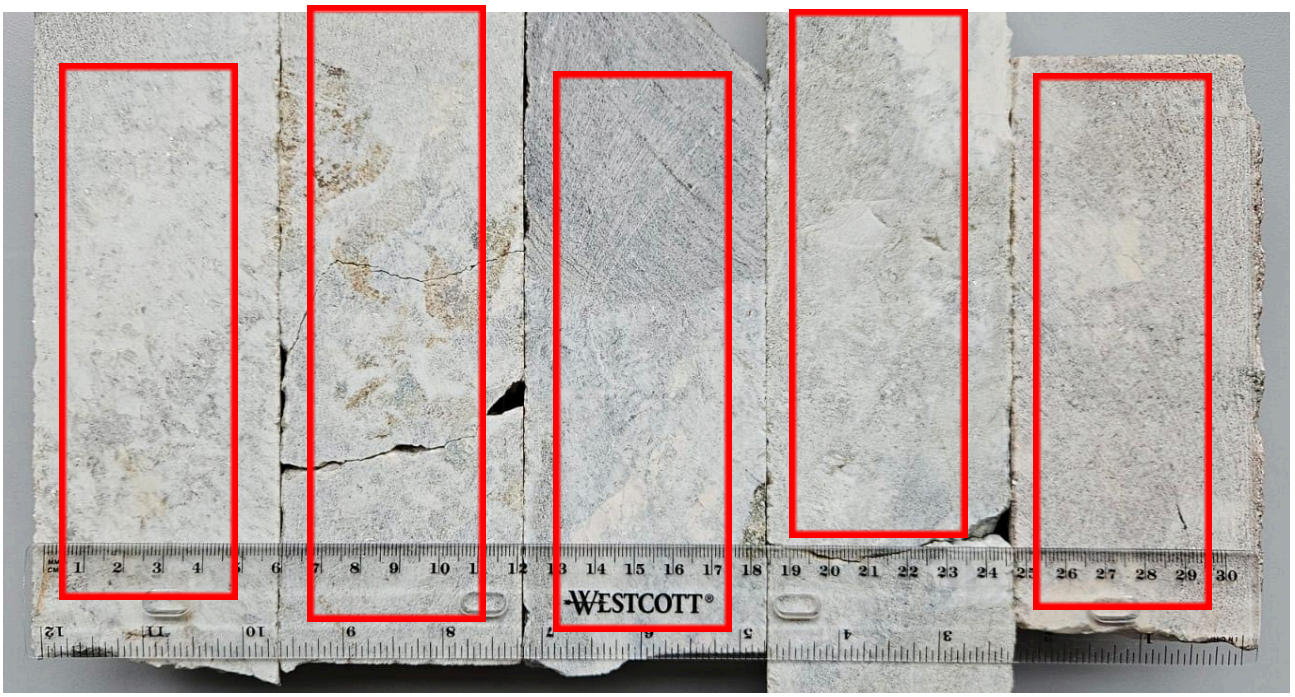

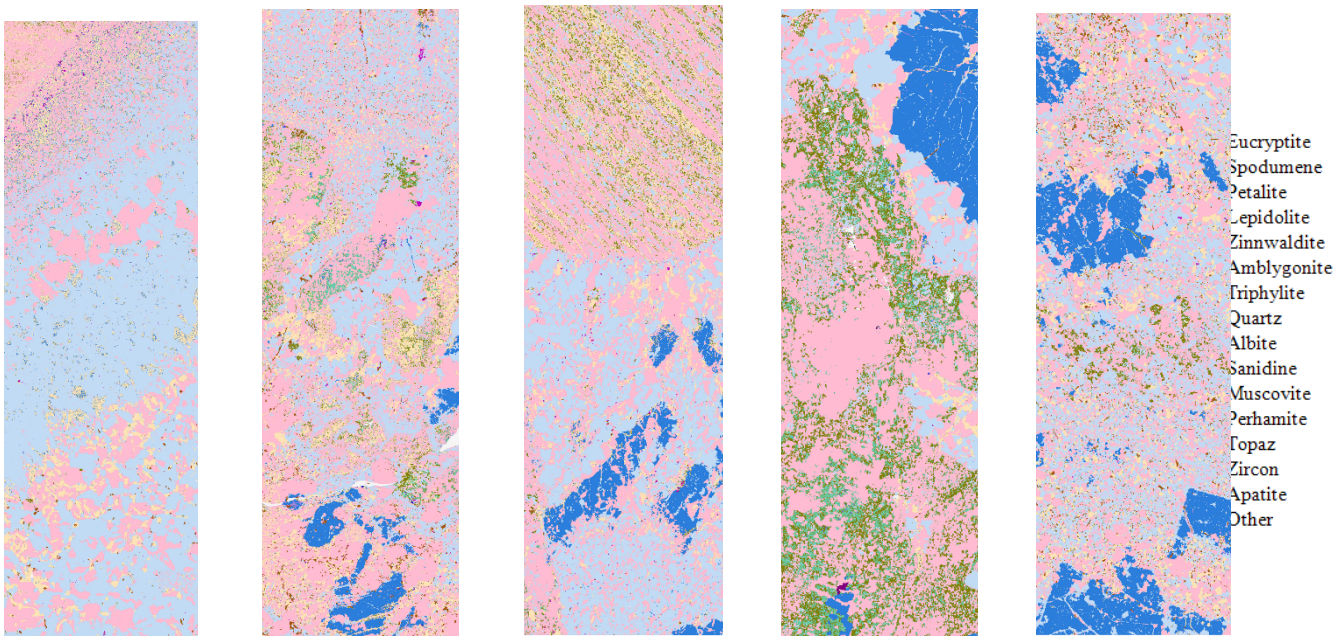

Figure 3. This image compilation shows: (a) Row 1: optical image of the curved surface of the drill core; (b) Row 2: optical image of the flat cut surface for analysis; (c) Row 3: the micro-XRF mineralogy (AMICS) of each sample, including Li-bearing minerals.