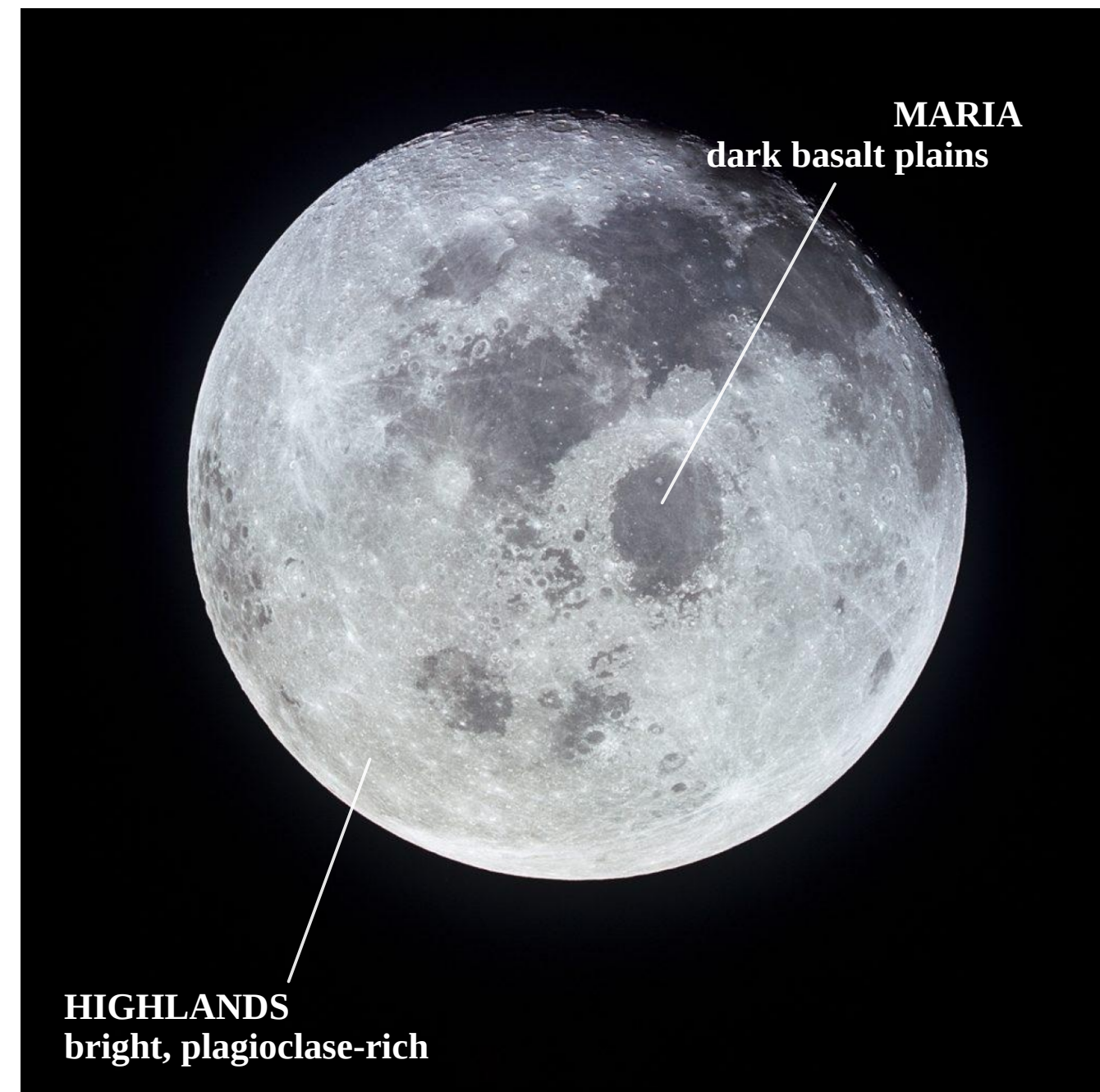


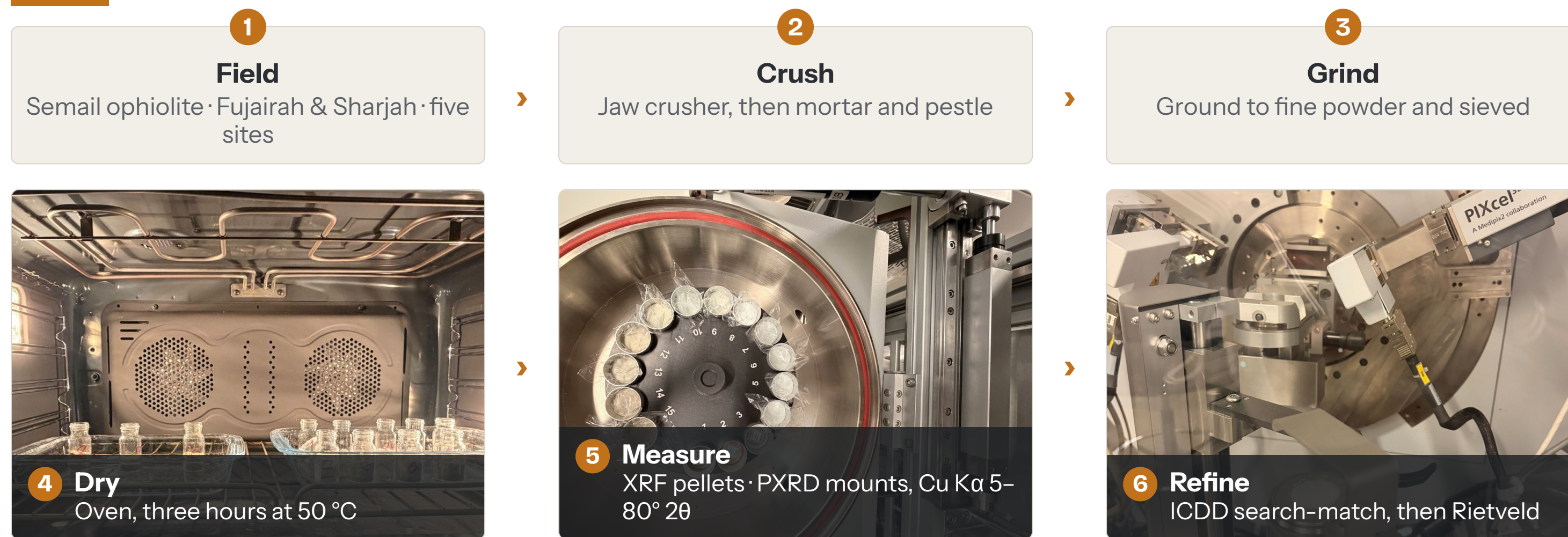


1 WHY A UAE HIGHLAND SIMULANT?



- Only about **385 kg** of regolith has ever come back from the Moon. Too little to test with, so simulants do the work.
- The south pole, where Artemis, ESA and the ILRS are headed, is **highland terrain**. Most simulants are made from basalt, which is the wrong rock.
- The ELS becomes the **first highland lunar simulant sourced locally in the Middle East**.

2 SAMPLES AND WORKFLOW



3 BULK CHEMISTRY (XRF)

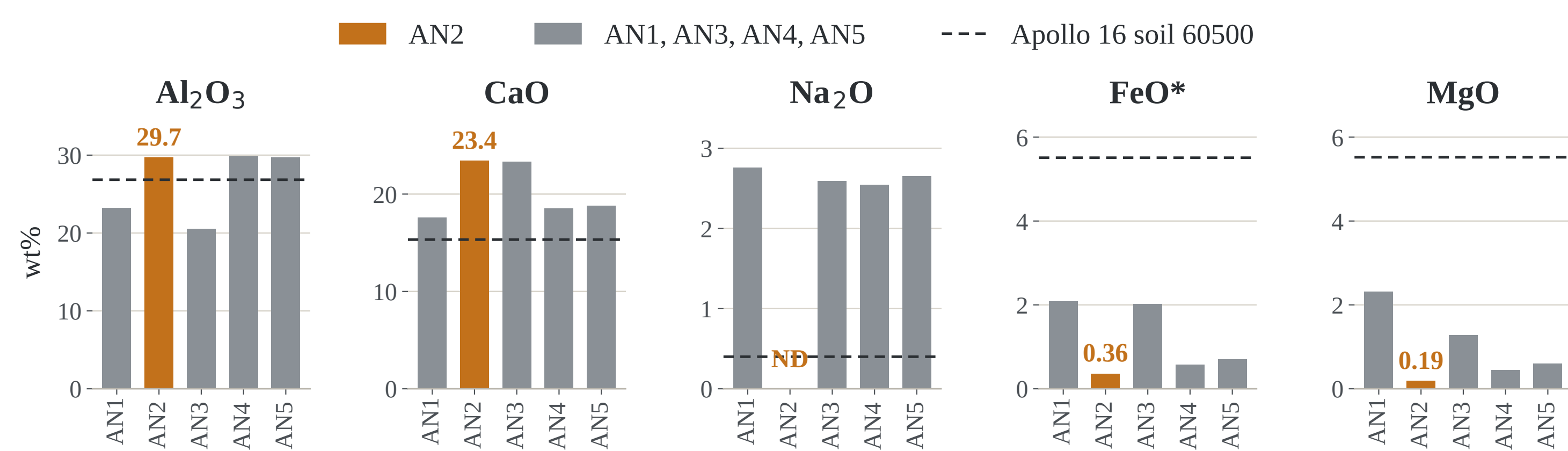


Figure 1. Major oxides at AN1–AN5. Dashed line is Apollo 16 soil 60500. ND = not detected.

- Every site is feldspar-dominated. They fall into two groups: an alumina-rich, iron-poor trio (AN2, AN4, AN5) and a more mafic pair (AN1, AN3).
- AN2 stands apart:** the most calcium, the least iron and magnesium, and no sodium at all.
- AN2, AN4 and AN5 match each other on alumina, so the same rock can be quarried repeatedly across the complex.

AN2 is the closest of the five to Apollo 16 highland plagioclase. Its sodium sits below the Apollo value and its calcium is the highest of the five.

4 MINERALOGY: PXRD AND RIETVELD

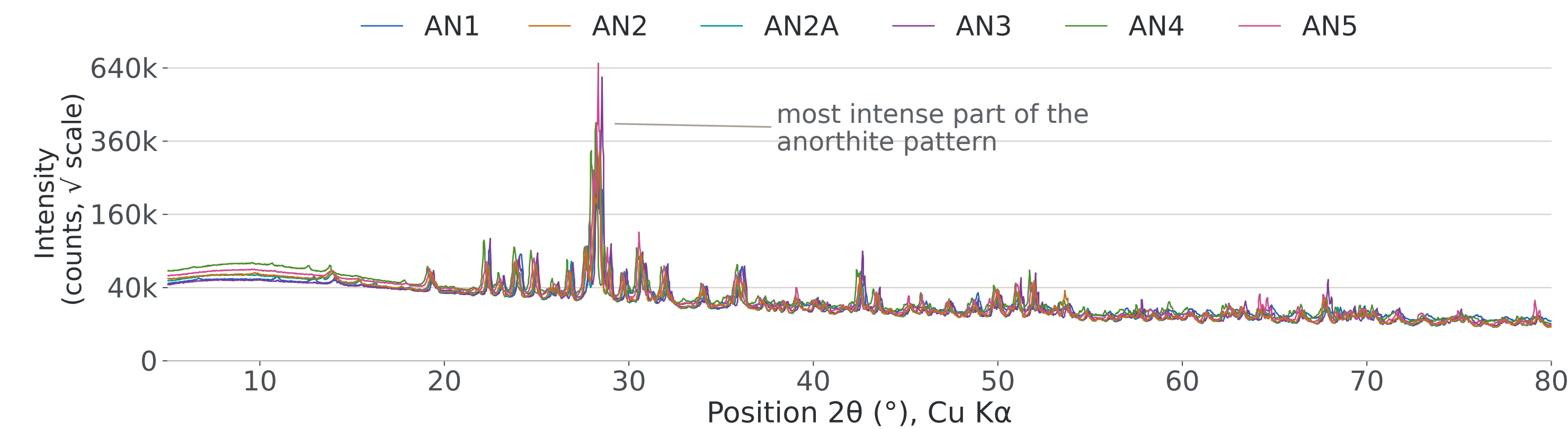


Figure 2. Diffraction patterns for AN1 to AN5 and the duplicate AN2A, overlaid. Intensity on a square-root scale.

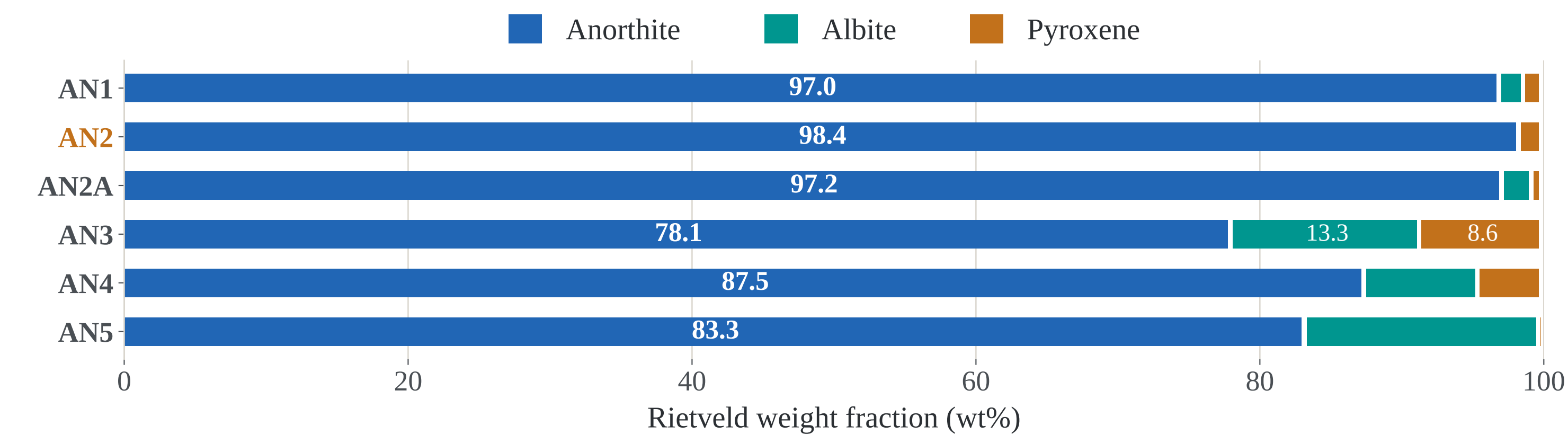


Figure 3. Rietveld weight fractions. $R_{wp} = 16.94$ at AN5, 15.49 at AN4. Anorthite and albite are the only feldspars accepted and pyroxene-group phases the only other minerals: no olivine, quartz or carbonate at any site.

5 AN2: THE PRIMARY FEEDSTOCK

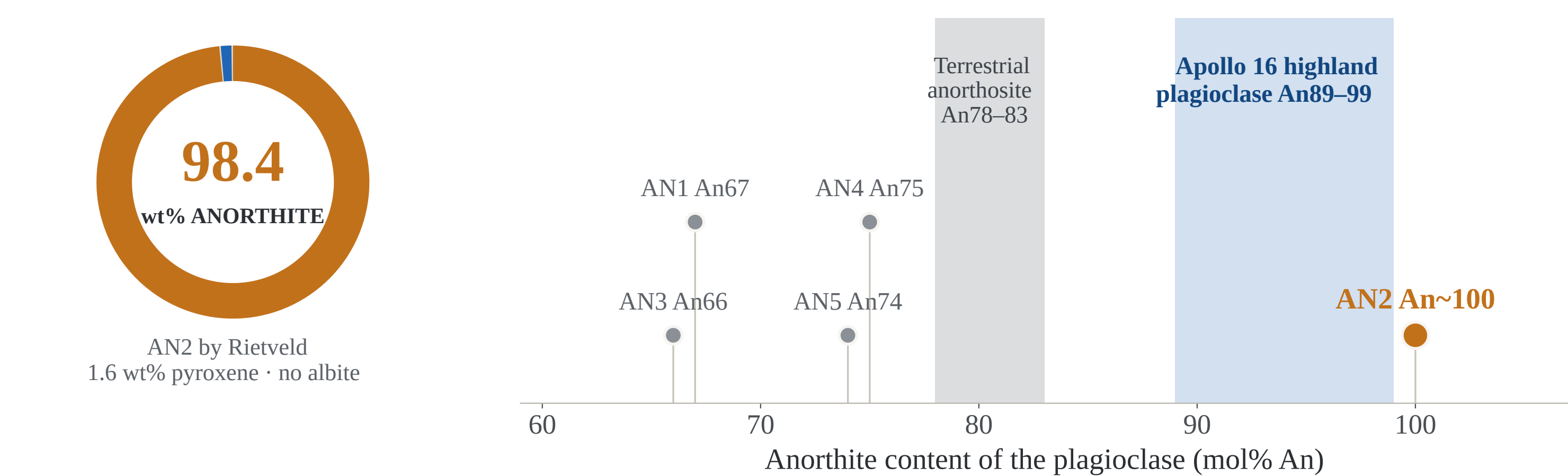


Figure 4. AN2 phase composition and the anorthite content of all five sites. The duplicate AN2A from the same site refines to 97.2 wt% anorthite, so the purity belongs to the site and not to one hand specimen.

6 BENCHMARK: OTHER FEEDSTOCKS

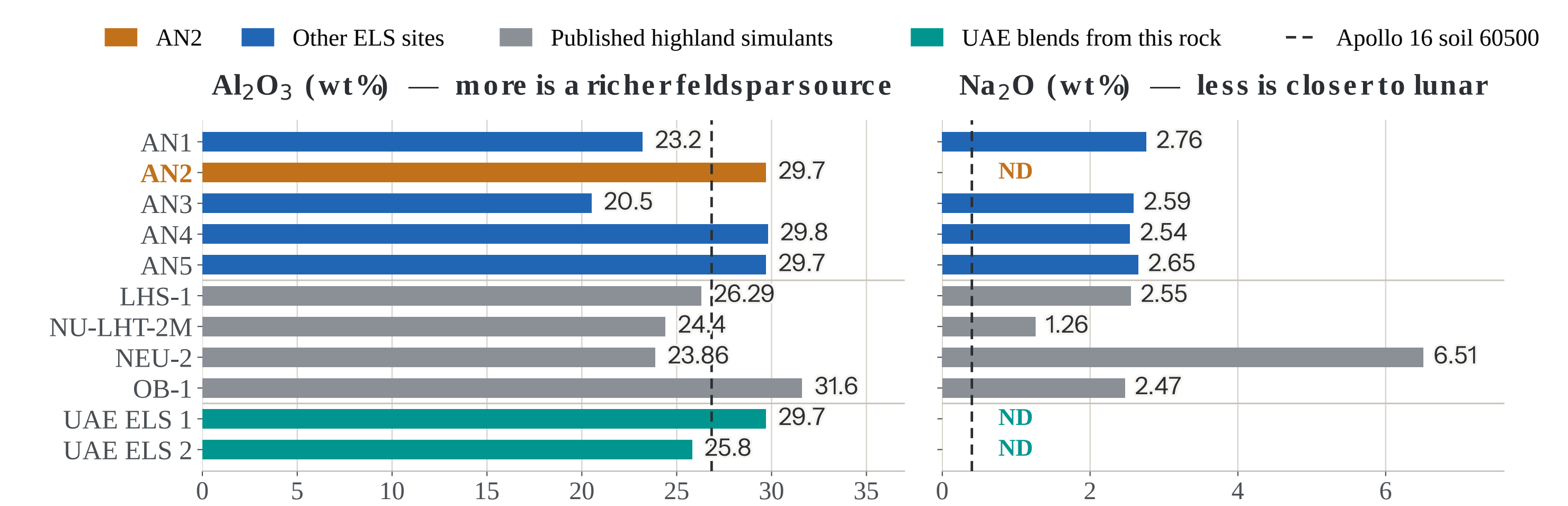


Figure 5. AN2 against the feedstocks behind published highland simulants, and the UAE blends.

7 CONCLUSIONS

UAE anorthosite is the right feedstock

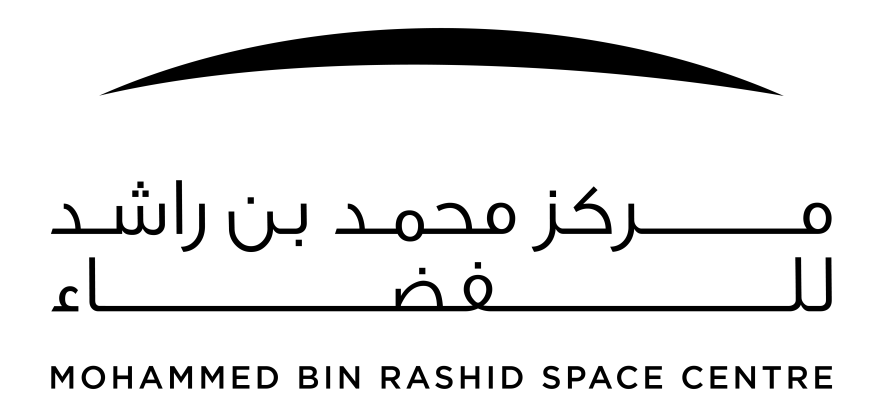
AN1 to AN5 supply the anorthosite base. Blended in proportion, the ELS is built to match Apollo 16 highland regolith.

AN2 is the primary source

98.4 wt% anorthite, no detectable sodium, and the only site whose plagioclase sits inside the Apollo 16 An89–99 range.

Where it goes

Equipment testing and experiments for **Artemis** and **MBRSC** missions, and for the **Saadiyat lunar testbed** at the Space Exploration Laboratory.



The simulant is still under extensive biological research.

8 LIMITATIONS AND NEXT STEPS

- Anorthite content is a **bulk estimate**. EDS on AN2 grains will confirm it directly.
- Some calcium is **not accounted for** by feldspar or pyroxene. A calibration check and loss on ignition come next.
- These are **feedstock rocks, not a finished blend**. Particle size and morphology follow.

ACKNOWLEDGEMENTS

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