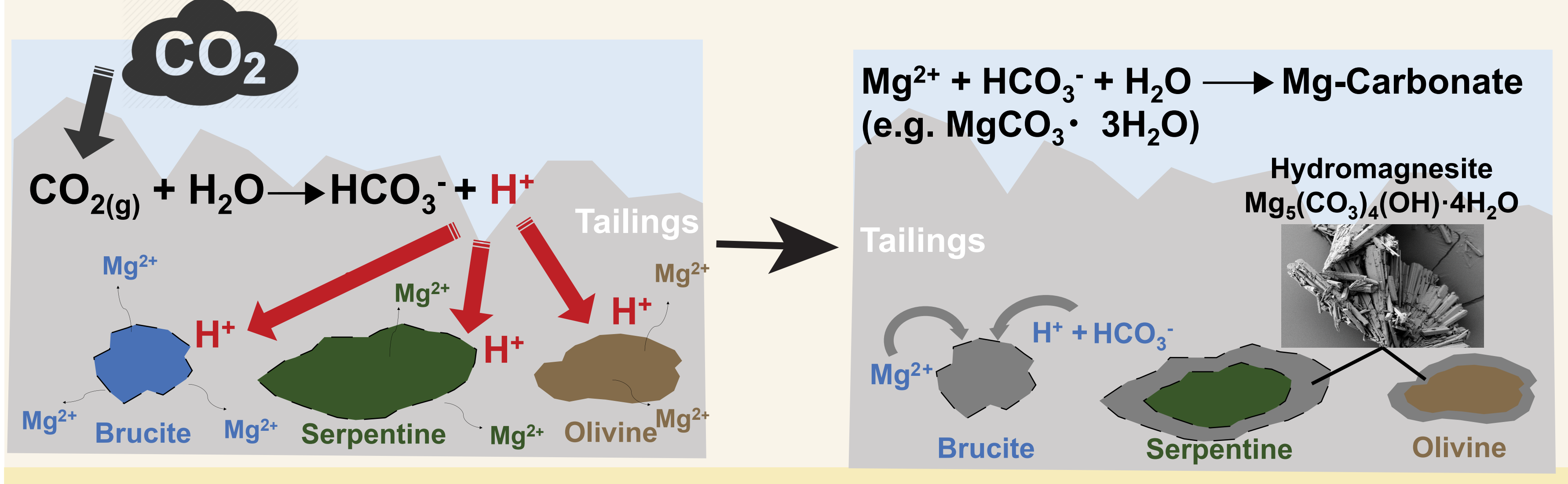


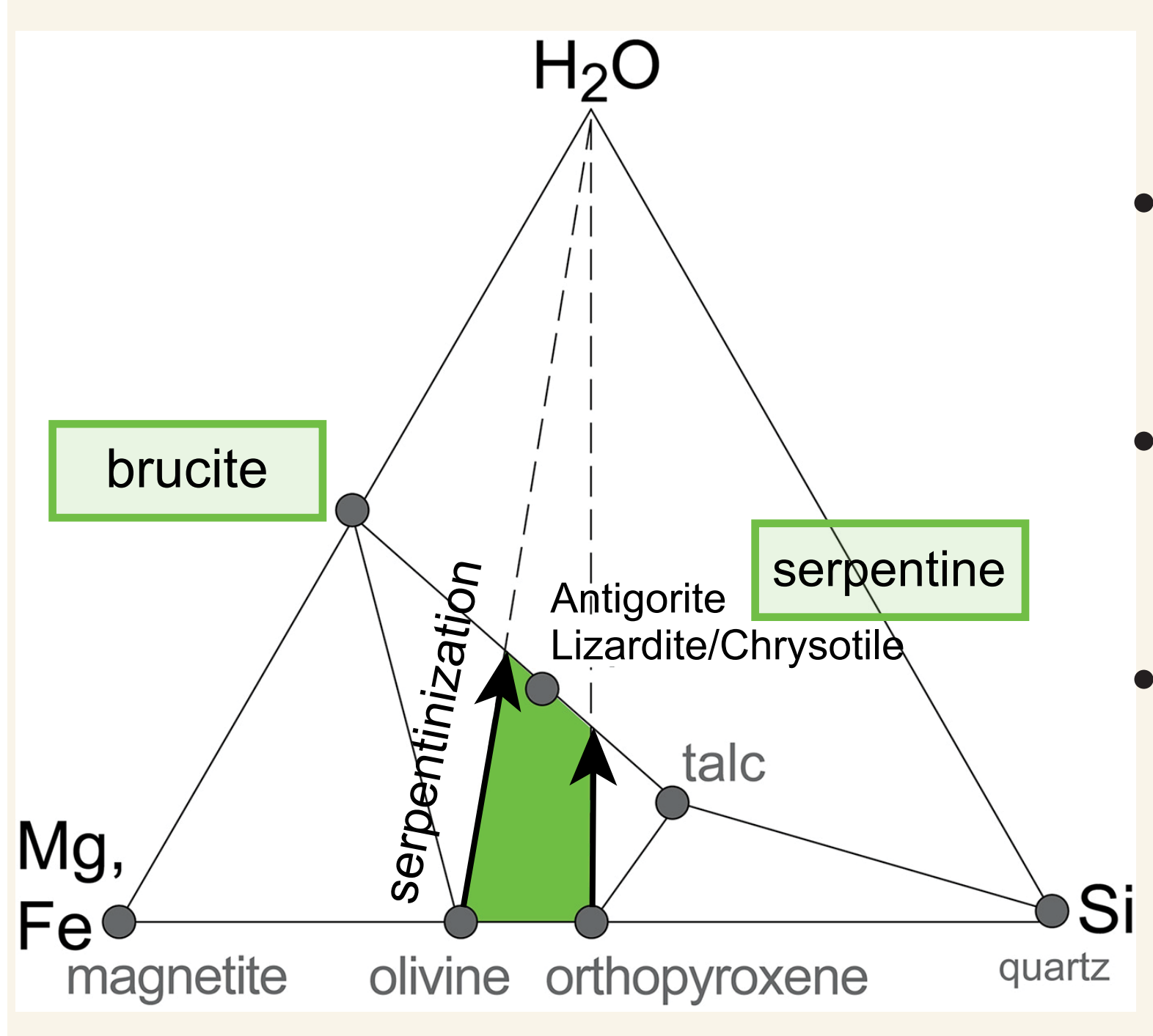
Carbon mineralization - Intro

Step 1: Rocks & tailings dissolution Step 2: Carbonate mineral precipitation



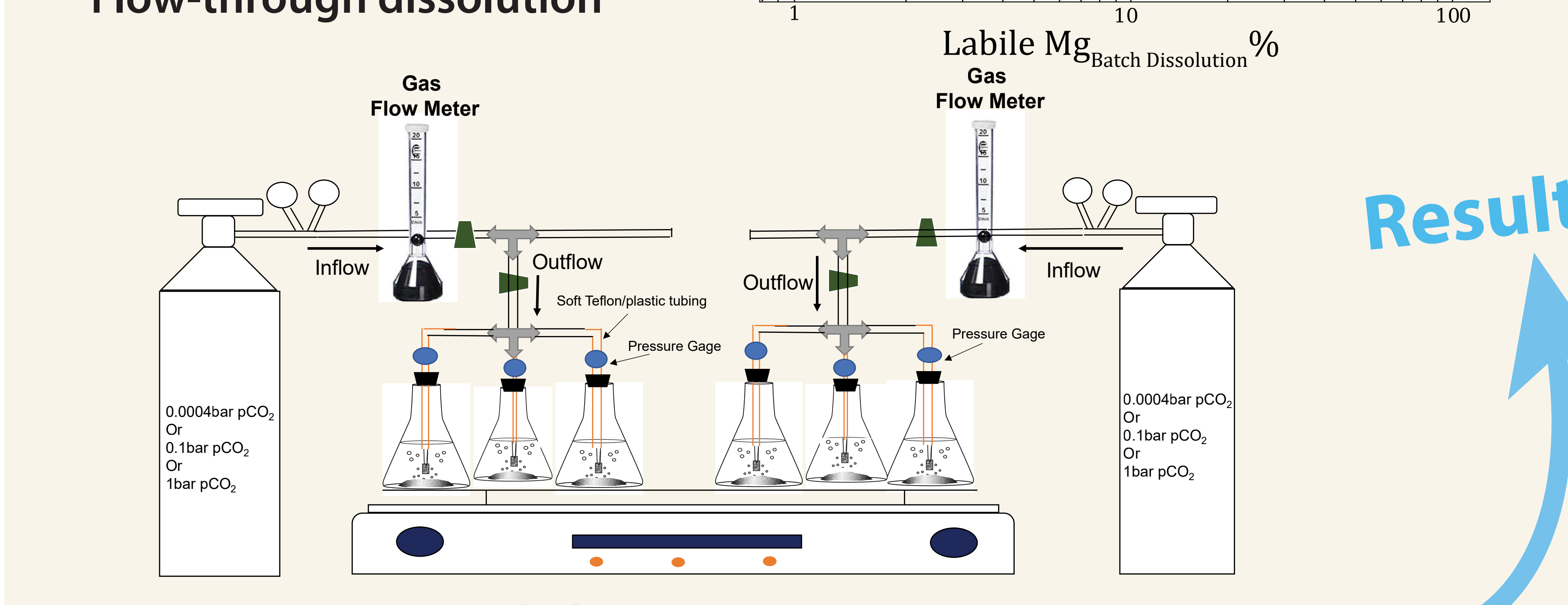
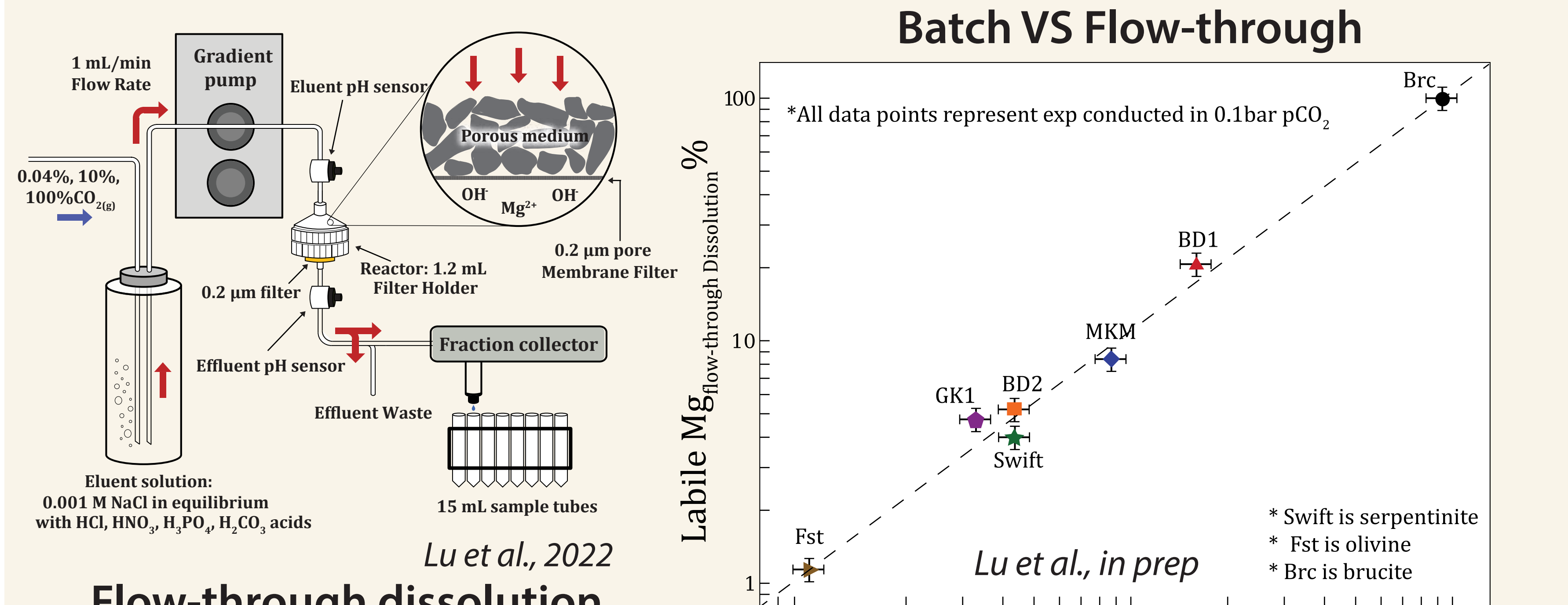
Reactivity - Intro

Mineralogy, geochemistry, hydrogeology Hierarchy of reactivity:

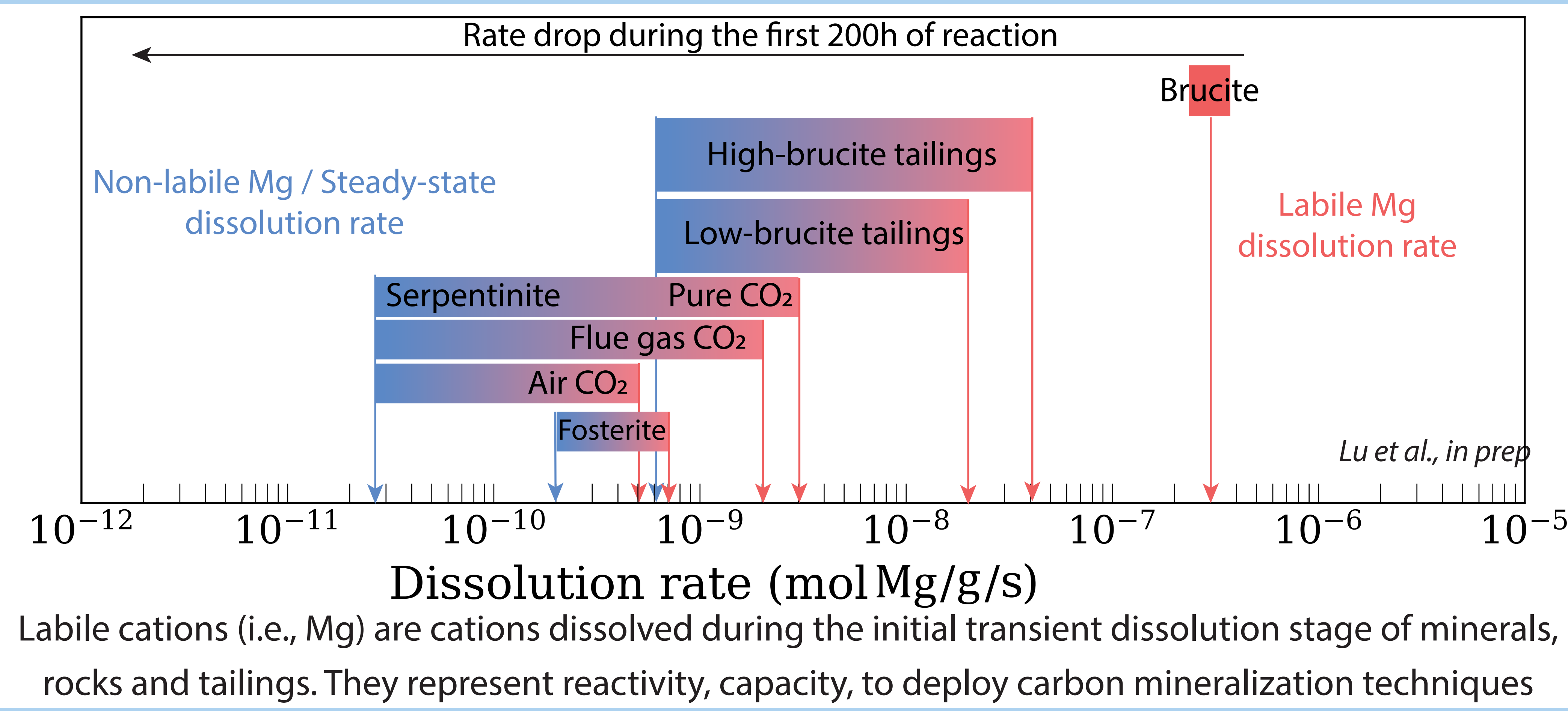


- Bulk dissolution of oxides, hydroxides e.g. brucite, hydrotalcite
- Surface reaction e.g. clays, sheet silicates
- Bulk dissolution of silicate minerals e.g. olivine (forsterite), wollastonite, plagioclase, feldspar, pyroxene

Experimental Methods

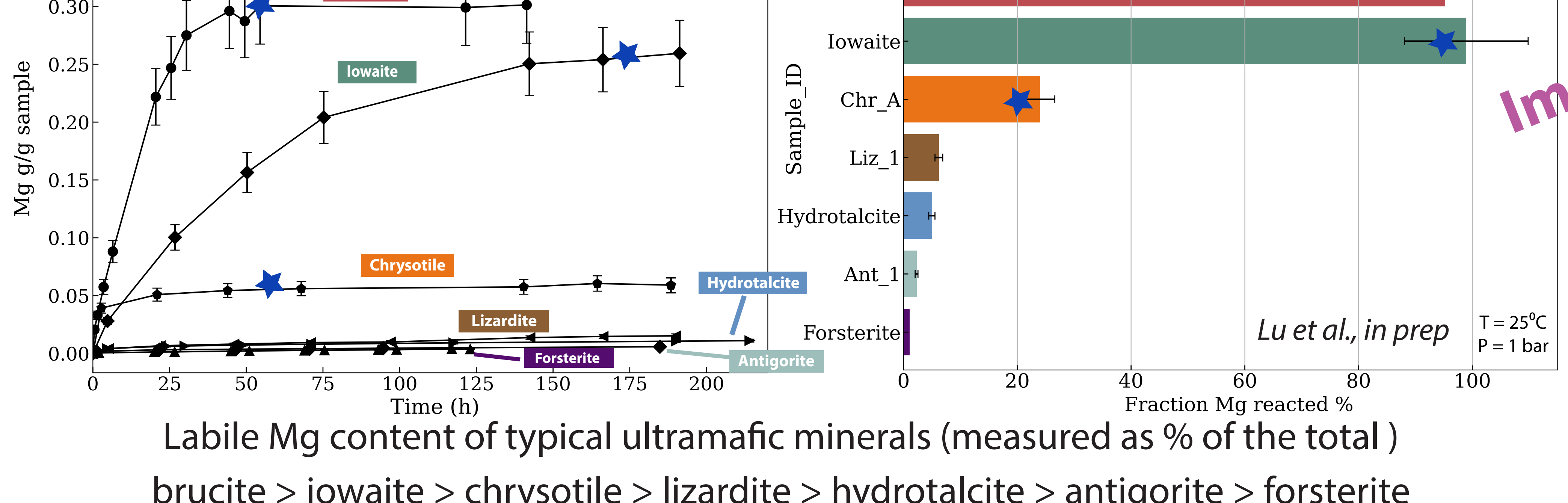


Result 1: Labile Cations (Mg²⁺)- What is it?

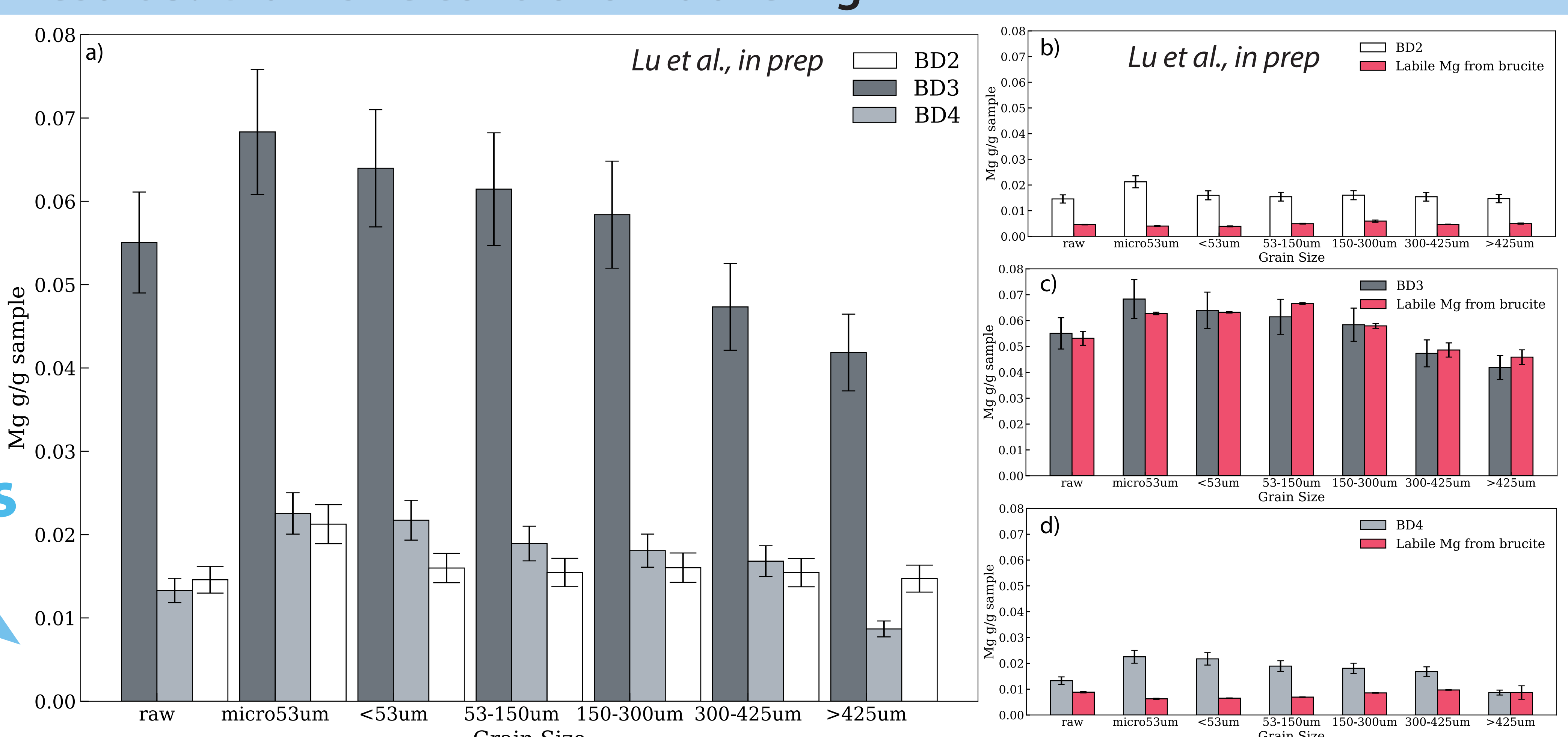


Labile cations (i.e., Mg) are cations dissolved during the initial transient dissolution stage of minerals, rocks and tailings. They represent reactivity, capacity, to deploy carbon mineralization techniques

Result 2: Quantification of labile Mg content in ultramafic minerals

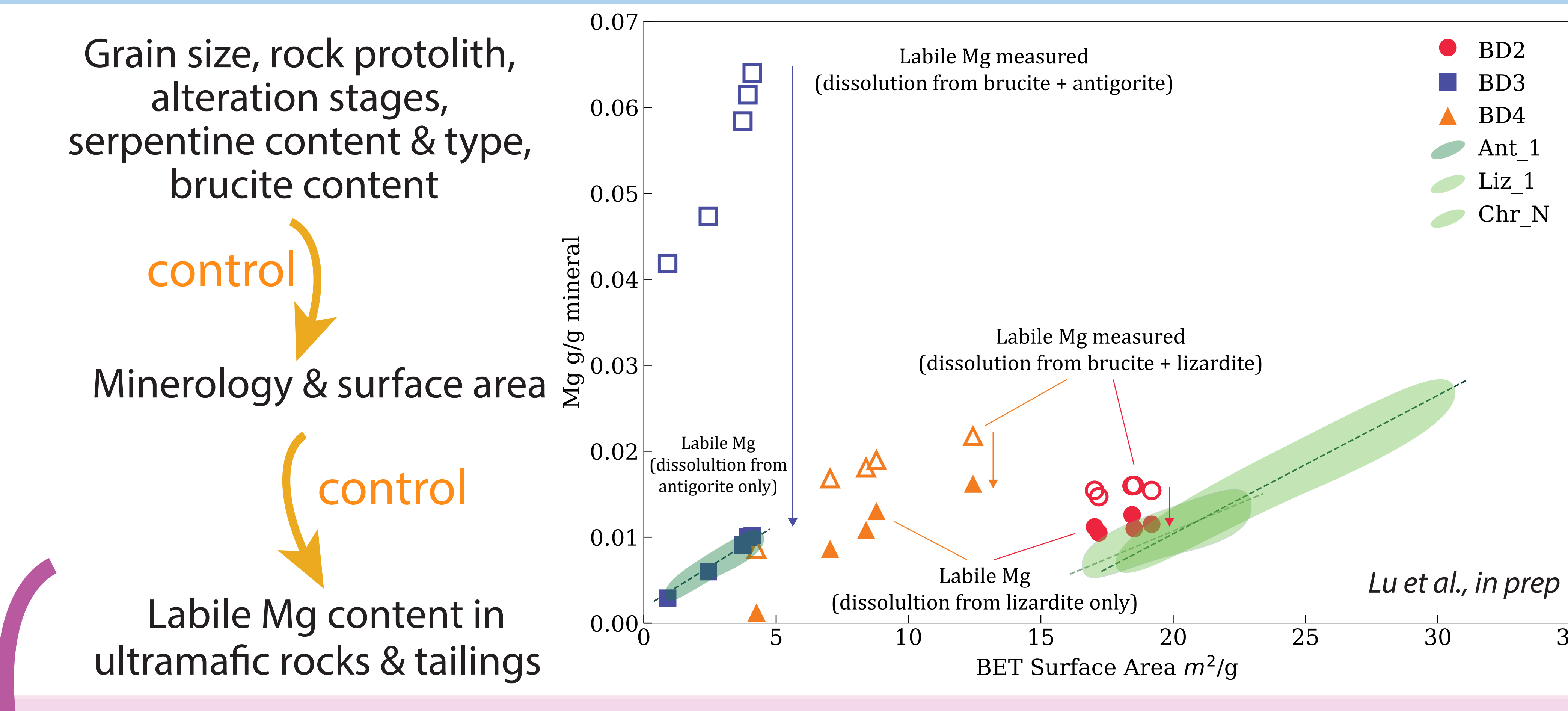


Result 3: Grain size control on labile Mg

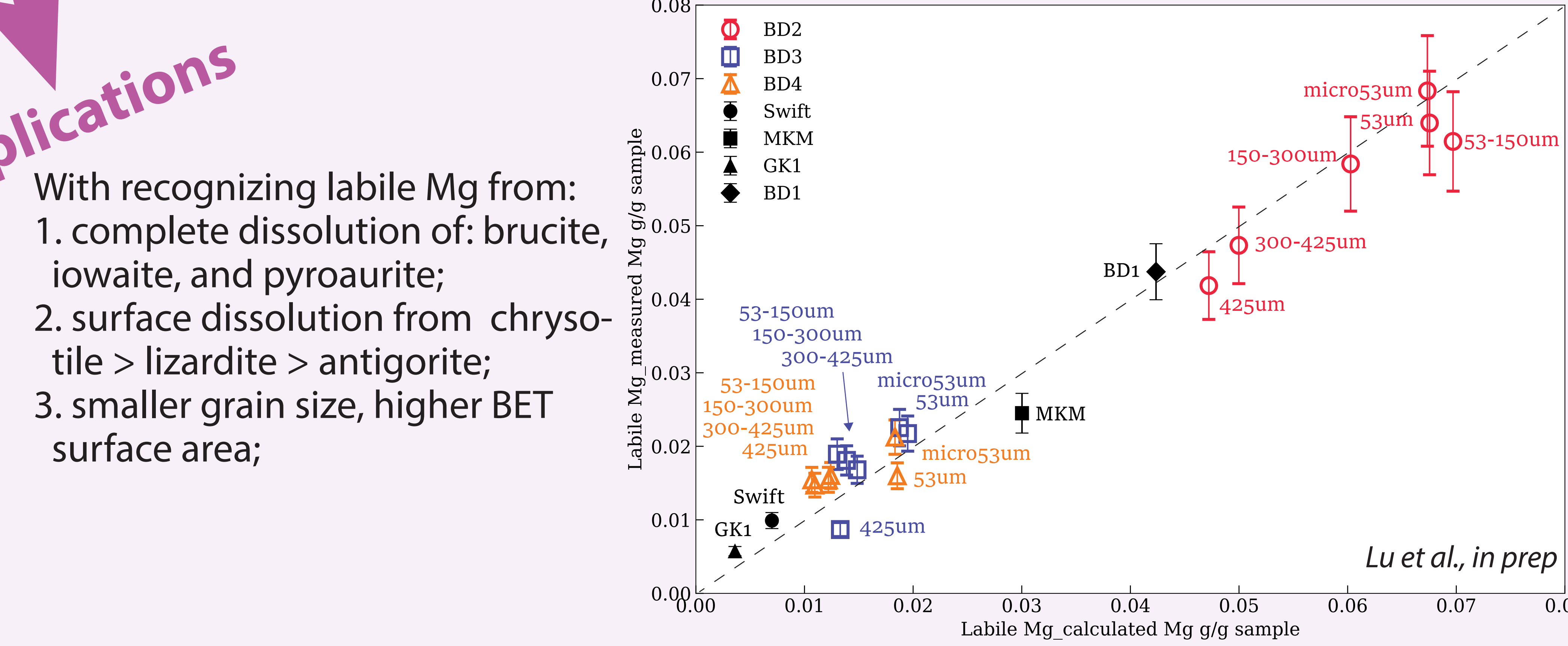


Comminution of ultramafic rock and tailings into fine particles is advantageous for leaching labile Mg due to: 1. reduce grain size, increase reactive surface; 2. alters mineral exposure, lead to differences in brucite and serpentine abundance.

Result 3: Fundamental Controls of labile Mg



Implication 1: Labile Mg (i.e., Reactivity) estimation & prediction



With recognizing labile Mg from:

- complete dissolution of: brucite, iowaite, and pyroaurite;
- surface dissolution from chrysotile > lizardite > antigorite;
- smaller grain size, higher BET surface area;

Implication 2: From reactivity to CO₂ removal efficiency at mine sites

- Reactivity can be translated to carbon capture efficiency and compare against emission profiles at mine sites
- Mineralogy is the primary determining factor of reactivity
- Reactivity = labile cations = TCO₂ sequester / Tailings

Details of this research discussed more in:

- Lu et al., in prep (submitted)
- Lu Phd Thesis

Coming soon!

Acknowledgements: We acknowledge the grant support of the Natural Sciences and Engineering Research Council of Canada (NSERC) Discovery Grant to GMD. We thank Geoscience BC for grant support through the 2022 Geoscience BC scholarship program. Additional support provided by the University of British Columbia, Department of Earth, Ocean and Atmosphere Science. Additionally to our funding and partners; Natural Resources Canada, UBC, Geoscience BC.

For further info, check out:

carbmin.ca Lu et al., 2022

Results