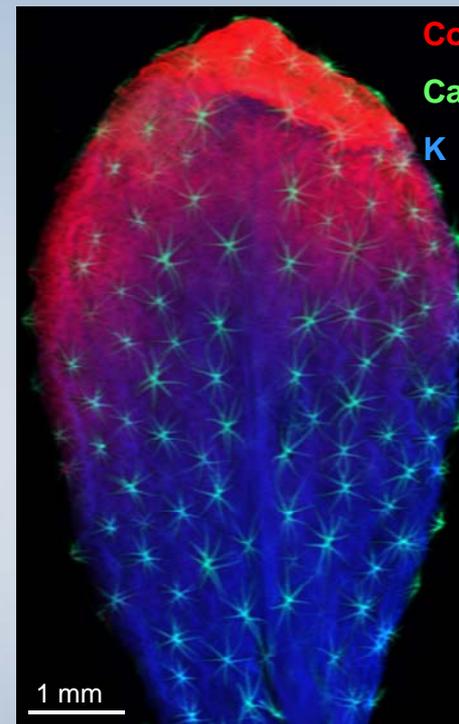


## Plants that Mine Heavy Metals from Contaminated Soil

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- Metal hyperaccumulating plants like *Alyssum murale* can accumulate high levels of heavy metals in aboveground biomass, thus providing a “green” remediation method for metal-contaminated sites (phytoremediation) and a “green” technology for mining metals of economic value from naturally-enriched soils (phytoremediation), but the mechanisms of metal tolerance remain poorly understood.
- By applying a suite of hard X-ray microprobe techniques such as X-ray fluorescence imaging (XRF) and X-ray absorption spectroscopy (XAS), the team discovered that *A. murale* lacks a cellular-level tolerance mechanism for (hyper)accumulated cobalt, and tolerance is achieved by expelling cobalt in the transpiration fluids which results in precipitation of cobalt-rich mineral phases on leaf tips and margins. XAS measurements revealed that cobalt is sequestered on the leaf surface as hydrous cobalt silicates and carbonates.
- These measurements are important to help understand the mechanisms of metal tolerance and homeostasis in plants which could be useful for improving phytoremediation/phytomining technologies as well as improving the nutritional content of plants.



XRF image of a hydrated *A. murale* leaf showing the preferential localization of cobalt (red) near the leaf tips/margins, calcium (green) in the stellate leaf trichomes (hairs), and potassium (blue) in the leaf; XAS measurements reveal cobalt speciation at the leaf tip is a mixture of hydrous cobalt silicates and carbonates.

Tappero, R., E. Peltier, M. Gräfe, K. Heidel, M. Ginder-Vogel, K.J.T. Livi, M.L. Rivers, M.A. Marcus, R.L. Chaney, and D.L. Sparks. 2007. Hyperaccumulator *Alyssum murale* relies on a different metal storage mechanism for cobalt than for nickel. *New Phytologist* 175:641-654.