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Total and Bioavailable Chromium Along a Toposequence in San Luis Obispo, CA.

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The presence of large quantities of Chromium metal in soil and plants is of major concern due to its toxicity to humans. Total (USEPA 3050a) and bioavailable (USEPA 1311) levels of chromium were measured along a serpentinic Central Coast toposequence. Soil from the surface and subsurface, as well as the above ground plants of the toposequence were determined and compared to several soil chemical and physical properties using a least squares regression. The binding environments and oxidation states were found through XANES and EXAFS x-ray spectroscopies. The total and bioavailable chromium concentrations of the soil averaged 1457.1 and 1.6 mg Cr/kg respectively, and the average total plant chromium was 115.2 mg Cr/kg. The difference between chromium in the soil surface and subsurface was not statistically significant. The concentrations of total soil and plant chromium were highest in the backslope positions with a value of 2528.8 mg Cr/kg in the soil and 288.5 mg Cr/kg in the above ground plants. Though the backslope positions had slightly elevated levels of Cr, slope position did not have a large influence on soil and plant total chromium levels. The soil chemical and physical properties did not show a significant linear relationship with chromium levels. The dominant form of chromium found in both the bulk-soil and plant samples was Cr^{3+}, this agrees with the low amount of bioavailable chromium found at the site. Sepentinitic parent materials naturally lead to high chromium levels in soils and plants, so the ability to understand how chromium interacts with soil properties is crucial in the effective landscape management of areas rich in this metal.

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