in NT than in PL. C-C crop sequence generally contained the highest amount of HA and FA in both NT and PL. The HA/FA ratio was generally higher in NT than in PL. In NT soil, the HA/FA ratio was higher in C-C than in S-S, but in PL soil, that ratio was higher in S-S.

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Don Juan Pond in Antarctica is unique for several reasons. It is the most saline of the Antarctic lakes, generally remains unfrozen in winter despite temperatures below -50 °C, and is the only natural occurrence of the mineral, antarcticite (CaCl₂·6H₂O). The objective of this paper is to demonstrate the utility of the PREZCHEM model by developing stability diagrams for ice, halite (NaCl), hydrohalite (NaCl₂·H₂O), and antarcticite in Don Juan Pond. The composition of Don Juan Pond at the calculated eutectic temperature (-51.8 °C) is CaCl₂·3.72 mol kg⁻¹ and NaCl = 0.50 mol kg⁻¹, which is similar but not identical to a pure NaCl-CaCl₂·H₂O system. The low eutectic temperature and high CaCl₂ concentrations of Don Juan Pond account for lack of freezing during winter. The model is compatible with the experimental data, and predicts the formation of ice during rare high water periods, halite, and antarcticite, all of which are reported from Don Juan Pond, as well as hydrohalite, which has never been observed at Don Juan Pond.

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Movement of Heavy Metals Through Soil Columns Treated with Acid Steel.
Making Plant Residue. N.M. AMARAL SOBRINHO; A.C. VELLOSO* and L.H. ANJOS,

Subsurface horizon samples of the area used by CSN - a steel-making plant, as industrial waste landfill, were taken and packed on glass columns. The objective was to reproduce field disposition of the residues; thus samples of this material were also disposed on top of the soil in a proportion of 1:4. Fifty pore-volumes were leached through the columns. After that, sections were taken and sequential extraction was used. The extracts were analyzed for heavy metals. Results indicated that Pb, Cr and Cu showed low mobility, probably due to low affinity of these elements for more stable chemical phases. Zn, Mn, Ni and Cd had an opposite behavior; the concentration increased with depth. Lastly, levels of Mn and Ni on the effluents were higher than accepted standards for tap water.

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Soil subsurface samples of an Ultsol were treated with alkaline and acid steel-making plant residues, and incubated for seven weeks and eighteen months. Dosages of residue varied from zero to one hundred tons per hectare. Sequential extraction procedure was used to separate four chemical fractions of the elements Zn, Mn, Pb, Ni, Cd and Cu: exchangeable, bounded to Fe and Mn oxides, bounded to organic matter, and residual. For both treatments, after eighteen months, the solubility of all heavy metals decreased, mainly due to sorption by oxides and concentration on residual fraction. Even at the highest dosage of residue, the ratio of heavy metals did not reveal contaminant levels, when compared to cultivated soil normal limits, suggesting low hazards of this practice for the groundwater table.

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Prospects for Phytoremediation of Selenium-Contaminated Soils in the Western U.S. D. R. PARKER, Univ. of California, Riverside.
Selenium has become a significant environmental concern in the western U.S., particularly where it is discharged into wetlands or other inland impoundments. Irrigation and drainage projects are a primary source of Se-laden brines, but fossil fuel extraction/utilization may also lead to Se contamination. Phytoremediation of soils, sediments and/or wastewaters is appealing because it may be the only affordable means of mitigating Se problems. There is a number of Se-accumulating genotypes indigenous to North America, including some "hyperaccumulators" in which shoot concentrations can exceed 1000 μg Se g⁻¹. Despite this genetic potential, however, few studies have been conducted to assess the overall utility of these plant species. Other, faster-growing plants that accumulate Se to only ~100 μg Se g⁻¹ may be equally promising, but have not been shown to be effective at the field scale. Other barriers to success include the insolubility of Se in many soils and sediments, the need for plant tolerance of high levels of salinity and boron, and the ubiquity of the sulfate ion which competitively inhibits the uptake of selenate. Possible solutions to these barriers, as well as the research investment required for successful field implementation of phytoremediation technologies, will be discussed.

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Effects of Experimental Parameters on Soil-Herbicide Sorption.
Coefficient of Field-Moist Soils Determined Using Supercritical Carbon Dioxide. E.A. ROCHELLE* and W.C. KOSKINEN, USDA/ARS, St. Paul, MN.

In this study we determined the effects of experimental parameters on soil-herbicide sorption coefficients (Kds) obtained using supercritical carbon dioxide (SF-CO₂) to remove herbicides from soil water with water contents below field capacity. Experimental parameters included soil type, moisture content, temperature, CO₂ density, and soil moisture potential. Five soils with clay contents from 1 to 23%, organic carbon from 0.1 to 2.6%, and pHs from 4.4 to 6.2 were used. Low-density SF-CO₂ Kd values for atrazine increased as the content of clay and organic matter in the soil increased. Kd values obtained with short, low-density SF-CO₂ sweep periods could be obtained repeatedly from soil samples after 7-min. equilibrations between sweep periods. Little atrazine could be removed from desiccated soil with the SF-CO₂ method, though increasing the soil water content from 5 to 16% notably increased SF-CO₂ Kd values. In general, increasing the SF-CO₂ density and temperature decreased soil-atrazine Kd values.

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Aging Effects on the Kinetics of Cesium Desorption from Vermiculite and Contaminated Soil. A.M. BRENNAN and D.L. SPARKS, Univ. of Delaware.

Radioactive 137Cs is a worldwide environmental problem due to soil contamination from fallout and ground disposal of liquid radioactive wastes. Since 137Cs remains in the soil environment for many years as a result of its strong adsorption, diffusion into clay interlayers, and long half-life (33 years), it is important to determine how aging affects 137Cs desorption. This study uses a batch technique to measure 137Cs sorption kinetics over extended periods of time (from one to 90 days) with Ca-saturated vermiculite ("zonolite" from Libby, MT). Additionally, the experiment uses an already contaminated soil sediment from Oak Ridge National Laboratory (TN) to measure desorption kinetics.

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Aging Effects on the Kinetics of Sorption and Release of Pb on Soil.
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The fate of Pb in soil has been the subject of intense study for many years. However, few studies have considered the effect of residence time on soil-Pb interactions. This aging effect is an important consideration, since in field conditions the soil and Pb are in contact for longer than the traditional 24-hour equilibrium time used in many laboratory studies. In this paper we investigate the significance of aging on Pb sorption and release from soil. The kinetics of Pb sorption is followed up to six months by measuring the amount of Pb remaining in solution as a function of time. A comparison of the rate of release of Pb from soil incubated for different lengths of time is shown. Also, the rate of release of Pb from soil contaminated in the laboratory is compared with the release of Pb from an analogous soil contaminated in the field for many years.

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