THE IMPORTANCE OF SOLID AND SOLUTION SELENIUM SPECIATION IN MOBILITY AND PLANT UPTAKE OF SELENIUM FROM WYOMING COAL MINE LAND RECLAMATION[1]

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Abstract: Selenium (Se), an element of interest and concern, has the potential of becoming increasingly mobile with time in oxidizing environments. During surface mining activities, exposure of Se-containing materials to oxidizing environments can result in elevated levels of mobile and plant-available Se, thus impacting the post-mining land use of abandoned and reclaimed coal mine lands (i.e., grazingland, pastureland and/or wildlife habitats). The main objective of this ACML supported research project was to examine the geochemistry of Se in abandoned and reclaimed coal mine sites, and native rangelands. Specific research tasks included: 1) development of a rapid and cost effective method for determining Se species in backfill and soil materials of abandoned and active coal mine sites, 2) examination of solidphase and solution speciation of Se in the rooting-zone of mine soils for correlation to plant uptake, 3) characterization of Se adsorption/desorption and precipitation/dissolution processes controlling Se mobility in backfill and soil environments, and 4) determination of plant uptake of Se at coal mine lands and other affected sites that can be correlated to Se solid-phase and solution-phase speciation. Plant, soil, and backfill or overburden samples were collected from abandoned, reclaimed and native sites at five surface coal mines located in the Powder River Basin (PRB) during 1991 and 1992; a reclaimed abandoned coal mine located near Rock Springs and a reclaimed uranium mine located in the southern PRB were also sampled in 1992. Forty three sites were established within thirteen transects located on the seven different mines. Project research discussed in this poster will include: suitable instrumentation for Se analysis (Ion Chromatography (IC) and AAS with hydride generation); Se extraction methods (phospate>AB-DTPA>hot water>saturated paste); solution Se speciation (water, hot water ($CaCl_2$), AB-DTPA, and phosphate extracts); Solid Se speciation 90.25M KC1, 1M KH_2PO_4, 4 N HC1, KC10, + 12 N HCl, and concentrated HNO_3 + HclO4 + HF); adsorption/desorption studies; precipitation/dissolution studies; plant Se characterization; and soil chemical and pedological characterization. Additional information determined from this study will be presented in a special symposium entitled "Selenium: Mining, Reclamation, and Environmental Impacts" which will be held during the Gillette ASSMR meetings.

Additional Key Words: Selenite, selenate, soil-plant relationships.

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