Figure 3.4b shows that the removal of fine particles from the third constant-flow leaching column had essentially no effect upon alkalinity concentrations produced by the Brush Creek shale samples. The time plots of the three constant-flow columns in Figure 3.4b are nearly identical, and represent consistently higher alkalinity concentrations than the pairs of columns and humidity cells with CO_2-saturared influent water. These findings support the principle that the major factors controlling alkalinity production from a rock sample with a high neutralization potential are the solubility of the carbonate minerals and the partial pressure of carbon dioxide in the system (i.e. in the pore spaces in the leaching column or in the spoil gas mixture in a mine environment). The concentration of alkalinity produced tends to be independent of particle size and surface area, if sufficient time is available to reach saturation. Saturation with respect to $CaCO_3$ was reached in all instances within the 24-hours that the sample was inundated with water. The ultimate alkalinity that can be produced under inundated conditions is a function of the PCO_2, whereas, the major factors controlling sulfate (and acidity) production from a rock sample with appreciable total sulfur content include particle size and surface area.

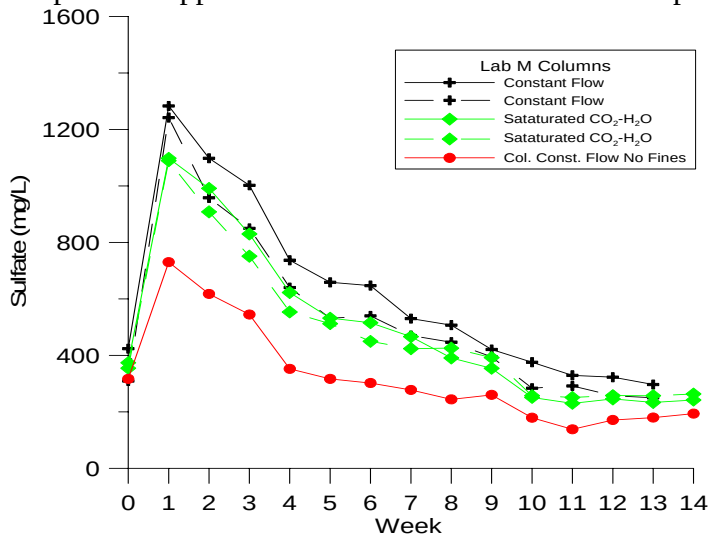

Figure 3.4a**.** Effects of fine particle fractions on sulfate production in shale.

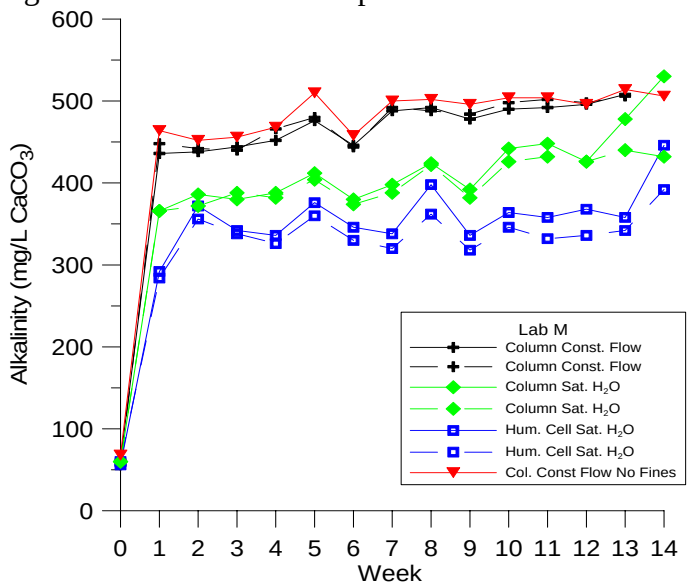

Figure 3.4b. Effects of fine particle fractions on alkalinity in shale**.**