$$FeCO_3 + H^+ \rightarrow Fe^{+2} + HCO_3^- \quad (19)$$

or (2) by the neutralization and dilution of an acidic mine water with an alkaline ground water or (3) by the neutralization of an acidic mine water by content with limestone and/or other basic materials.

The components of unaerated alkaline mine water include HCO_3^-, $CO_3^=$, CO_2, H_2CO_3, Fe^{+2}. Alkaline water containing iron which has been aerated usually contains little or no iron in solution. Most of the iron present appears as a colloidal suspension.

C. Characteristics of Mine Water

1. Iron Content - The principal iron species (5) which are found in mine water are believed to be Fe^{+2}, Fe^{+3}, $Fe(OH)_2(s)$, and $Fe(OH)_3(s)$.

Fe^{+2} is usually associated with the oxidation products of pyrite which have been leached from the mine by ground water. The principal soluble oxidation product is $FeSO_4$. However, $FeSO_4$ hydrolyses and oxidizes to form various hydroxides, some of which are also soluble. Fe^{+2} in mine water is also associated with $FeCO_3$. Natural ground water leaching such minerals as siderite will contain Fe^{+2}. It is believed the $FeCO_3$ dissociates and ionizes and is in equilibrium with Fe^{+2}, $CO_3^=$, HCO_3^-.

Fe^{+3} in mine water occurs in solution under specific conditions. At low pH, <3, Fe^{+3} is in solution. At higher pH, Fe^{+3} will be found in solution only as part of complexes formed with organix chelates, phosphates, and other anions. In the absence of chelating agents, Fe^{+3} should not be found in significant quantities in solution in mine drainage above pH 3.

a. Solubility of Iron - The principal iron species, Fe^{+2} and Fe^{+3}, form hydroxides which are insoluble. The solubility product (20), K_{sol}, for $Fe(OH)_2$ at 25 C in "slightly basic media" is 5.25×10^{-14}. The distribution of soluble Fe^{+2}