2. Aluminum, Manganese, Calcium, Magnesium Content:- In addition to iron, four other major cations occur, namely, aluminum, manganese, calcium and magnesium. Trace elements may also be present. Aluminum and manganese are found in mine water due to the dissolution of minerals in the strata in contact with acid mine water. Calcium and magnesium are major cationic components of most ground water, due to dissolution of limestone, dolomites, and magnesites.

Aluminum and manganese are significant mine water components in that they form insoluble hydroxides at pH levels obtained during mine water treatment.

3. Total Acidity:- Total acidity is defined (27) as the amount of standard base required to titrate a sample of mine water to pH 8.3 after removal of dissolved CO_2. The total acidity does not indicate the acid condition, i.e., the $[H^+]$ of the mine water, but reflects the potential total quantity of $[H^+]$ which is liberated during the oxidation and hydrolysis of various cations in solution. For example,

$$Fe^{+2} + 3\ H_2O \quad \rightleftarrows \quad Fe(OH)_3 + 3\ H^+ + e$$

represents the overall reaction involved in the oxidation of ferrous iron to ferric iron and the subsequent hydrolysis of the Fe^{+3} ion. Al^{+3} and Mn^{+2} are two other mine water components which contribute to acidity. The relative acidity of each of the mine water constituents is as follows:

H^+	1 ppm of H^+	= 49 ppm of acidity at H_2SO_4
Fe^{+2}	1 ppm of Fe^{+2}	= 1.75 ppm of acidity as H_2SO_4
Fe^{+3}	1 ppm of Fe^{+3}	= 2.625 ppm of acidity as H_2SO_4
Al^{+3}	1 ppm of Al^{+3}	= 5.44 ppm of acidity as H_2SO_4
Mm^{+2}	1 ppm of Mm^{+2}	= 1.78 ppm of acidity as H_2SO_4