Modification of some methods for determination of Gypsiferous soils properties

ABSTRACT

Gypsiferous Soils are common found in arid and semi arid regions, as the solubility of gypsum plays an important role in determining the properties of such soils. It is well known that the solubility of gypsum increased with decreasing the particle size of gypsum. Seventeen surface and sub surface soil samples (differ in their contents of gypsum), were collected from the east and the middle regions of Saudi Arabia. Also two samples from a natural gypsum rock and pure gypsum were used in this study. Soil samples were air-dried, ground and throughly mixed to pass through a 2 - mm sieve, and stored for the physical and chemical analysis. The selected soil samples were used in some lab. Experments. The aim of such experiments were to study the factors affecting gypsum solubility and the best methods for the determination of Gypsiferous Soils Properties such as texture , as well as the cation exchange capacity of such soils. This study included the following treatments: the impact of time, shaking; heating , beside the effect of adding some saltes such as $CaCl_2$, Na_2CO_3 and $BaCl_2$ on gypsum solubility.

The obtained results could be summerized as follows:

1. Factors affecting gypsum solubility:

- Results indicated that there were some factors played an important role in gypsum solubility, As the solubility gypsum were increased with increasing either equlibrium time, and time of shaking as well as the gypsum partical size.
- The concentrations of SO_4^{2-} in soil samples were relativily increased compared the the concentrations of Ca^{2+}, especially at the 1 st shaking times up to 30

minetes. This may be due to the role of clay surfaces on increasing Ca^{2+} adsorption than SO_4^{2-}

- Heating Gypsiferous Soils at 75 C^o resulted in loss of the two molucular of water in Gypsium structure. This will change the Gypsium hardeness to be easily crused in to very fine particales due to converted Gypsium to another mor soluble mineral . this reflected in increasing Ca^{2+} and SO_4^{2-} concentrations especially at the 1 st shaking times when compared with the samples dreid at 25 C^o . Conseqently, heating Gypsiferous Soils at 75 C^o had an important role in accelerating the solubility of Gypsium in Soil samples.
- Adding Na_2CO_3 to the Gypsiferous Soils resultied in increasing gypsium solubility due to the formation of $CaCO_3$. such finding confermied by the XRD which indicated the pricinces of Calite peakes at (0.304nm) especially at the higher applications of Na_2CO_3 and heating at at 75 C^o, while the peakes of gypsium (0.756 nm) under such conditions was disappeared.
- The addition of $CaCl_2$ to the Gypsiferous Soils resulted in decreasing gypsium solubility, while the additions of $CaCl_2$ + Na_2CO_3(0.5M) resulted in increasing gypsium solubility. This was more prononced by treating the soils with $CaCl_2$ + Na_2CO_3(2M) especially in the soils containing less than 51.9 % gypsium.
- The addition of $BaCl_2$ to the Gypsiferous Soils resulted in decreasing gypsium solubility, due to the formation of $BaSO_4$ which precipetate in the initial equlibrium stage.

2. Modifining the methods of texture determination for the Gypsiferous Soils:

- Results of the determination of texture the Gypsiferous Soils depending on the use of co ion with or without Na_2CO_3 indicated that there were a significant effect for treating the soil before the finial treatment of the mechanical analysis .

As the the percentages of clay ; silt and sand were differ according to primary treatment and the used leaching treatments.

- The highest clay percent was obtained with the treatment of $CaCL_2$ (1.5M) along with Na_2CO_3(0.5M). while the relatively lowest values were genarally obtained by leaching the soil with distilledwater.
- The use of Na_2CO_3(0.5M) for dispersion resulted in increasing the clay percent compared to the uses of Na_2CO_3(2 M)
- The use of BaCl2 (0.2M) resulted in