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İSTANBUL TEKNİK ÜNİVERSİTESİ 1773

FLOCCULATION AND COAGULATION

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1. GENERAL INFORMATION

Coagulation and flocculation are generally used to increase the efficiency of precipitation and filtration operations, which are two basic methods of dewatering. As it is known, in suspensions which consist of finely ground mineral particles and water, the particles sometimes stick to each other and form larger particles and this is called flocculation while separation of agglomerated particles is called dispersion. Neither of these two situations is the normal state of pulp, both of them can be created artificially. These two situations are always present in various mineral processing systems where solid and water coexist. In some systems, for example, in classifiers, mineral particles are dispersed, in some systems such as settling tanks, mineral particles are flocculated. The term flocculation is generally used synonymously with Coagulation. The difference between them is that coagulation is a clustering controlled by electrical attraction forces, while flocculation is achieved by forming a physical bridge between the particles with the effect of high molecular weight organic substances (Polymers).

Adsorption of polymers on mineral surface; medium pH, ionic strength, pulp temperature, zeta potential of the mineral surface, water solubility of minerals, polymer molecular weight, polymer structure, the charge of the active group in pulp and the preparation of the polymer and its form of addition to the system are important factors.

2. PURPOSE OF THE EXPERIMENT

Ensuring the precipitation of the sand sample (-0.038 mm) with the addition of various flocculants and coagulants for solid-liquid separation before the filtration process under different conditions and calculating the thickener area according to the result of the precipitation processes.

3. EXPERIMENTAL PROCEDURE

-0.038 mm sized quartz sample will be used in the flocculation process. In addition, 1000 cc standard cylinders for precipitation, 0.1% anionic (A-100), cationic (C-491), non-ionic (N-300) flocculants from Kemira company and $CaCl_2$, $AlCl_3$ coagulants, a stir bar will be used to stir the pulp and a timer to control the sink time.

Group	Percentage of solid, wt%	Reagent type	Reagent amount, g/t
1	10	Anionic flocculant	10
2	10	Cationic flocculant	10
3	10	Non-ionic flocculant	10
4	10	$CaCl_2$ coagulant	1500
5	10	$AlCl_3$ coagulant	1500

4. REQUESTED

- Give general information about the flocculation process. (10 pt)
- Write down the conduct of the experiment. (10 pt)
- Discuss the results of experiments and compare the flocculation and coagulation both methods and reagents. (20 pt)
- Draw an altitude graph based on time. (30 pt)
- Calculate the area and height of a thickener with 10 t/h capacity under the conditions obtained for each group. Find the solids concentration in wt% solids at the end of the precipitation. (30 pt)

CALCULATION OF THICKINER AREA and HEIGHT

Q = Feed (t)

H_0 = Initial height (m)

H_S = The height of the fluid / suspension interface when the concentration is CS (m)

C_0 = Initial solid concentration (t/m^3) (10 wt% must be converted to t/m3)

C_S = End of Precipitation solids concentration (t/m^3)

T_S = The time that corresponds to the height of HS (from the graph you have drawn) (h)

$$C_0 * H_0 = C_S * H_S$$

Thickener area calculation: $A = (Q * T_S) / (H_0 * C_0)$

Thickener height calculation: $H = [(Q * T_S) / A] * [(1 / \rho_{solid}) + (X / \rho_{liquid})]$

H: Thickener Height (m)

X: Average liquid / solid ratio at the beginning and at the end of the collapse

X: (Liquid / solid ratio at the feed + Liquid / solid ratio at the outlet) / 2

Specific weight of solid = 2.65 gr/cm^3