A STUDY OF THE EFFECTS ON DISSOLUTION CONSTANTS AND ACTIVATION ENERGY IN A STIRRED TANK

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Constant kinetics dissolution and activation energy for solids with spherical geometry were calculated. Also the influence of the stirring rate and agitator geometry were studied. Three types of sails arrangement were chosen: The first agitator was composed of two sails, the second agitator was composed of four sails sloping 45 degrees, and the last agitator was composed of six sails with a ring.

In the first part of the experiment it was possible to determine the dissolution constant (k), by means Hixon-Crowell model (eq-1) and experimental data of weight variation through time at constant temperature.

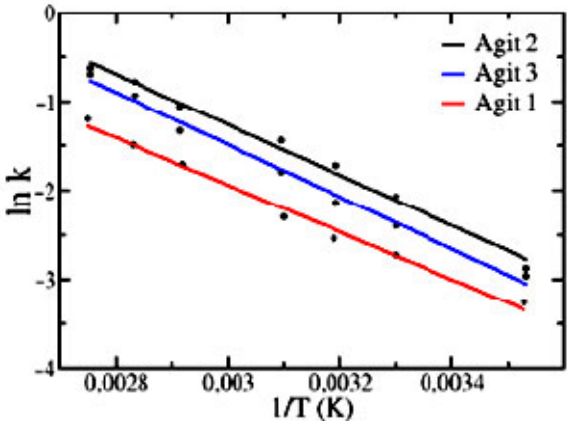
$$M^{1/3}(t) = Mo^{1/3} - kt \qquad (1)$$

Where M(t): weight variation with the time, t: time, Mo: weight at t = 0, k: dissolution constant.

Furthermore, on the dissolution constant, the stirrer effects of angular velocity were studied, finding a direct relationship between 200-650 RPM, but for highest velocities we found that there is a negative effect on the dissolution constant.

For the second part, the experimental equipment was immersed into a thermal bath (Thermohakee Phoenix II-C41P) and the agitator's velocity was maintained at 630 RPM. The temperature was modified between 10ºC and 80ºC determining the constant dissolution at many temperatures. Afterwards supposing a similar behaviour to Arrhenius equation, it was possible to estimate the activation energy for each type of agitator. These results are shown in Figure 1.

Figure 1.Determination of activation energy in a dissolution process for the three types of agitators.



The activation energy in the dissolution process was similar for each type of agitator because the straight lines had the same slope (Figure 1). It was also possible to observe the effect of the system geometry over dissolution constant, for this case the straight lines displayed a pre-exponential factor similar for the second a third agitators meanwhile in the first one it was approximately three times lower than in the second and third agitators.

REFERENCES

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