

TEMPORARY DISAGGREGATION OF PARTICLES IN COAGULATION OF HUMIC WATERS

P. DOLEJŠ

Institute of Landscape Ecology, Czechoslovak Academy of Sciences
Na sádkách 7, 370 05 Č. Budějovice (Czechoslovakia)

SUMMARY

In the coagulation of humic substances into separable aggregates, disaggregation was observed for coagulant doses smaller than optimum, and within several tens of minutes subsequent to homogenization. Disaggregation is more pronounced as the alkalinity of water increases.

METHODS

Experiments were carried out using "model humic water" prepared from tap and distilled water and peat extract leached with distilled water. The experimental procedure, described in detail elsewhere (1), consists of injecting the model humic water into a 250-ml calibrated cylinder containing the coagulant. A very efficient and fast homogenization is achieved during injection. The only transport mechanism of destabilized particles is Brownian motion, which guarantees the physical similarity of all the experiments. Centrifugation at 7,000 g for 2 minutes was employed for separation. The ratio of coagulant in the aggregates separated by centrifugation to the total dosed coagulant is expressed in term of "aggregated coagulant ratio".

RESULTS

The results shown in Figures 1 a, b, were obtained by centrifugation carried out right after mixing coagulant with water ($t=0$), and subsequent to 50-minute and 24-hour reaction time.

Fig. 1a presents the course of aggregation of destabilized humic substances as affected by time and shows changes in the optimum coagulant dose depending on time between homogenization and separation of the suspension. As reaction time increases, higher doses of coagulant can be applied and a better removal of coloured substances is achieved. But at the alum ($Al_2(SO_4)_3 \cdot 18H_2O$) dose of 20 mg/l the result for $t=0$ is better than that for $t=50$

minutes from the view point of both the residual coagulant and colour. The observed phenomenon of disaggregation is far more distinct at higher alkalinity - Fig. 1b. Up to dose of 44 mg/L, the effect of separation is better at $t=0$ than after 50 minutes reaction time.

The disaggregation of particles already formed and separable in a gravitational field, occurring in several tens of minutes after homogenization, indicates instability of the system and affects the coagulant optimum dose, methods of its determination, and water works treatment results. It partially explains why lower doses of coagulant are generally needed in direct filtration treatment plants than in those with sedimentation included. The temporary reverse reaction is affected also by temperature and concentration of humic substances and will be subject of future research.

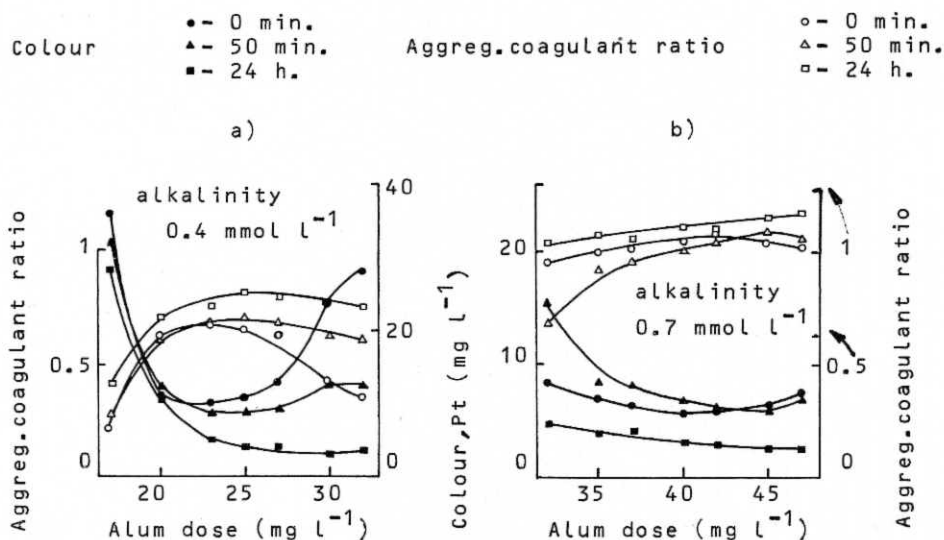


Fig. 1 a,b. Residual colour and aggregated coagulant ratio as a function of alum dose.

REFERENCES

- 1 P. Dolejš, Centrifugation Study of Humic Water Coagulation by Brownian Motion, in: L. Pawlowski et al. (Eds.), Chemistry for Protection of the Environment, Elsevier, Amsterdam 1986.