

Various Structures of Struvite Crystals – Jan Suschka, Eligiusz Kowalski, Sebastian Popławski

Summary

There is currently a considerable interest in the precipitation of struvite (magnesium ammonium phosphate) in waste waters, both because it can cause nuisance deposits in treatment works, and as a potential route to recover phosphates for recycling in the form of fertiliser. The literature shows that struvite crystals precipitated out from sewage can have either an orthorhombic or a needle-like shape. Our own experimental work on struvite precipitation, both in pure solutions and in waste water treatment plant liquors, suggested that the shape of the crystals formed was dependent on the presence or not in the reactor vessel of significant levels of free ammonia. Ammonium (NH_4^+ ion) concentrations are generally present in waste waters in relatively high concentrations (about $1.000 \text{ mg N-NH}_4^+/\text{dm}^3$ in sewage sludge liquors). Free ammonia, however, will only occur under certain reaction conditions: that is, if a rapid pH-increase occurs (e.g. if NaOH or other chemical addition is used to induce phosphate precipitation), but not if intensive aeration only is used for mixing or for CO_2 stripping (as this will drive off any free ammonia generated into the air). The published struvite crystallisation works on appear to confirm the hypothesis that the resulting crystal shape depends on free ammonia presence. This could have important implications for controlling and improving the processes for phosphorous recover for recycling by struvite precipitation.