

Guminska, J. Use of Particle Number Measurement in Analyzing the Mechanism and Efficiency of Water Pollutant Coagulation. *Ochrona Srodowiska* 2010, Vol. 32, No. 2, pp. 21–26.

Abstract: Owing to the obvious advantages of pre-hydrolyzed coagulants, many water treatment plants have substituted them for the conventional hydrolyzing coagulants. While in most instances pre-hydrolyzed coagulants are evaluated in terms of their basicity, there is a more reliable method of evaluating their potential for application. The method consists in the speciation of aluminum forms, including the proportions of monomeric to polymeric forms. Polyaluminum chlorides include considerable amounts of stable, polycationic pre-hydrolysis products, thus enabling the charges of the organic pollutants to be neutralized before the precipitation of aluminum. Monomeric species, however, are subject to transformation. After the coagulant has been added, the original monomeric species transform at a fast rate into polymeric species (believed to be more efficient than the original polymeric forms) and thereafter into precipitated forms. This is an indication that in some instances coagulants with a low degree of polymerization provide higher efficiencies of pollutant removal from the water being treated than do highly polymerized coagulants. The study has demonstrated that the understanding of the mechanisms governing the coagulation process enables the type and dose of the coagulant to be chosen adequately, taking into account the quality of the water being treated. Particular consideration, however, should be given to the pH and alkalinity levels, as they largely contribute to the transformation of aluminum species. To examine the changes occurring at the initial stage of flocculation (performed with three pre-hydrolyzed coagulants and two pH values of the water), use was made of particle number and particle size measurements. As shown by the results obtained, the choice of the coagulant desired makes it necessary to consider not only the characteristics of the coagulant itself, but also the quality of the water being treated, with emphasis on the pH. When the water was treated at pH=6.8, the most advantageous agglomeration of particles was attained with the coagulant where monomeric forms dominated. This finding substantiates the potential of producing *in situ* polymerized aluminum forms. When the pH of the water was increased to 7.9, this was concomitant with a noticeable rise in the number of fine particles ($<5\ \mu\text{m}$), which became removable under conditions of a well conducted sweep coagulation process.

Keywords: Coagulation, pre-hydrolyzed coagulant, speciation of aluminum forms, particle number distribution.