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TECHNICAL BRIEF

DRINKING WATER

New technologies for treating drinking water require effective monitoring techniques to ensure the complete long-term safety of the treated water. Two practical analysis methods have been developed to determine concentrations of residual polyelectrolytes in treated water.

Monitoring Residual Polyelectrolytes in Drinking Water

Use of polyelectrolyte flocculants

Introducing new technology into drinking water treatment invariably brings with it the challenge of demonstrating and ensuring the complete, long-term safety of water treated operationally with the help of the new technology.

This was the issue that arose as water treatment plants converted from traditional inorganic flocculants, such as aluminium sulphate and ferric chloride, to polyelectrolyte flocculants.

With increasing use of these materials, the safety of the product water became a growing cause for concern, on account of the adverse health effects polyelectrolytes might pose for potable water consumers if ingested in sufficient quantity over time, coupled with the lack of readily available methods for determination of residual polyelectrolyte concentrations. By contrast, residual amounts of the previously-used aluminium sulphate and ferric chloride have been easy to detect and control, using readily available standard methods.

Analysis and monitoring

Out of this uncertainty and concern, the need arose to develop, adapt and evaluate suitable methods for the determination of residual polyelectrolyte in final potable water.

The approach followed was to clarify the advantages and disadvantages of selected non-specific analytical techniques applied to quantify residual polymers, extend these existing analytical techniques to obtain accurate and reliable results and aim, finally, to achieve a detection limit at one tenth of the maximum permitted dose of the actual polymer. The development and adaptation of the appropriate analytical methodologies was done in the chemistry laboratory of Umgeni Water, on both distilled and real water samples.

The following methods were evaluated, and further developed, in the course of the research:

- A potassium polyvinylsulphate (KPVS) colloidal titration method;
- A Ponceau S-day method;
- A tannic acid method; and
- A high-pressure liquid chromatography (HPLC) method.

Of the methods investigated and refined, the former two methods proved the most successful in quantifying the amounts of residual polyelectrolyte. These methods showed good precision, with linear calibration curves. Detection limits of 1 mg/ℓ of polymer concentration could be achieved.

The tannic acid method described in published literature was unsuccessful for the determination of the polyelectrolytes. Normal phase HPLC, when using a size exclusion column and an ELS detector, was able to identify both polyelectrolytes, but only at very high detection values.

Conclusions and recommendations

Two simple and practical analysis methods to determine concentrations of residual polyelectrolytes in water have been successfully developed.

Application of either or both of these methods is recommended for monitoring purposes and for ensuring the safety of final, treated drinking water.

Further reading:

Polyelectrolytes in Drinking Water (**Report No: 1528/1/07**). To order this report contact Publications at Tel: (012) 330-0340; Fax: (012) 331-2565; E-mail: orders@wrc.org.za