

Characterisation of natural organic matter (NOM) and its removal using cyclodextrin polyurethanes

TI Nkambule, RWM Krause*, BB Mamba, and J Haarhoff

University of Johannesburg, Department of Chemical Technology, PO Box 17011, Doornfontein 2028, South Africa

Abstract

Natural organic matter (NOM) occurs in all natural water sources when animal and plant material breaks down. NOM in water may react with chlorine and other disinfectants to produce disinfection by-products (DBPs), many of which are either carcinogenic or mutagenic. In this study the NOM content of the raw water from the Vaalkop Water Treatment Plant (which uses both chlorination and ozonation as treatment protocols) was characterised after fractionation on ion-exchange resins. Fractionation at different pH values resulted in the isolation of a neutral, a basic and an acidic component of either predominantly hydrophobic or hydrophilic NOM. In addition, NOM results from 3 open water bodies in Johannesburg were evaluated in the same manner. As expected, NOM from all water sources was predominantly hydrophobic (~60%). Each of the 6 isolated NOM fractions was percolated through synthetic cyclodextrin (CD) polyurethanes to determine the extent to which the CD polymers can remove NOM from water. The hydrophobic basic fraction and the hydrophilic acid fraction were most efficiently removed (24% and 10%, respectively). The remaining fractions were not much affected by the polymer treatment.

Keywords: cyclodextrin polyurethanes, disinfection by-products, fractionation, natural organic matter (NOM)