

Andrzejewski, P., Nawrocki, L., Nawrocki, J. The Role of Manganese Dioxide ( $MnO_2$ ) in the Process of N-nitrosodimethylamine (NDMA) Formation During Reaction of Dimethylamine (DMA) with Some Oxidants in Water Solutions. *Ochrona Srodowiska* 2009, Vol. 31, No. 4, pp. 25–29.

**Abstract:** Owing to its carcinogenic and mutagenic properties, N-nitrosodimethylamine (NDMA) has been classified into the group of the most hazardous and undesired by-products that form during oxidation of water pollutants. Although chloramination seems to be the principal contributor to the formation of NDMA in the water being treated, the underlying mechanism is still far from being well understood. In this paper an explanation is proposed for the mechanism governing the formation of NDMA in the reaction of DMA with potassium permanganate or ozone. It has been demonstrated that when use is made of these oxidants, the reaction of DMA nitrosation is catalyzed either by the manganese dioxide that forms as the product of  $KMnO_4$  reduction, or by the  $MnO_2$  added to the water being ozonized. The manganese dioxide suspension, a product of the reaction of DMA with potassium permanganate, was found to be indispensable for the formation of NDMA in this reaction. It has been observed that NDMA also formed during the reaction of DMA with nitrites and nitrates in the presence of  $MnO_2$  even at the pH of 8.25, which is noticeably higher than the optimal value of 3.0–3.5 for the direct nitrosation of DMA. The presence of the  $MnO_2$  suspension during ozonation of DMA-containing water evidently increased the conversion of DMA to NDMA. The same was found to occur when nitrites were present in the reaction mixture. The results obtained substantiate the potential influence of  $MnO_2$  (regardless of whether added in the form of suspension, or when present in the catalytic filter beds) on the formation of NDMA in the water.

**Keywords:** N-nitrosodimethylamine (NDMA), dimethylamine (DMA), ozone, potassium permanganate, manganese dioxide, oxidation, water treatment.