Silver cyanide substances PNEC read-across approach

Two silver cyanide substances (silver cyanide and potassium dicyanoargentate) are due to be registered under REACH in 2018. A review of how these substances should be treated for risk assessment purposes has therefore been conducted.

Extrapolation of the decomposition half-lives of other metal cyanide compounds to silver cyanide compounds can be performed by comparison of the stability constants for the formation of the complexes (see Figure 1). The stability constant (log K) of silver cyanide of 20.5 is similar to that of Zn cyanide (21.6), indicating that this compound would be expected to decompose significantly within a relatively short time scale, such as the hydraulic retention time of an STP.

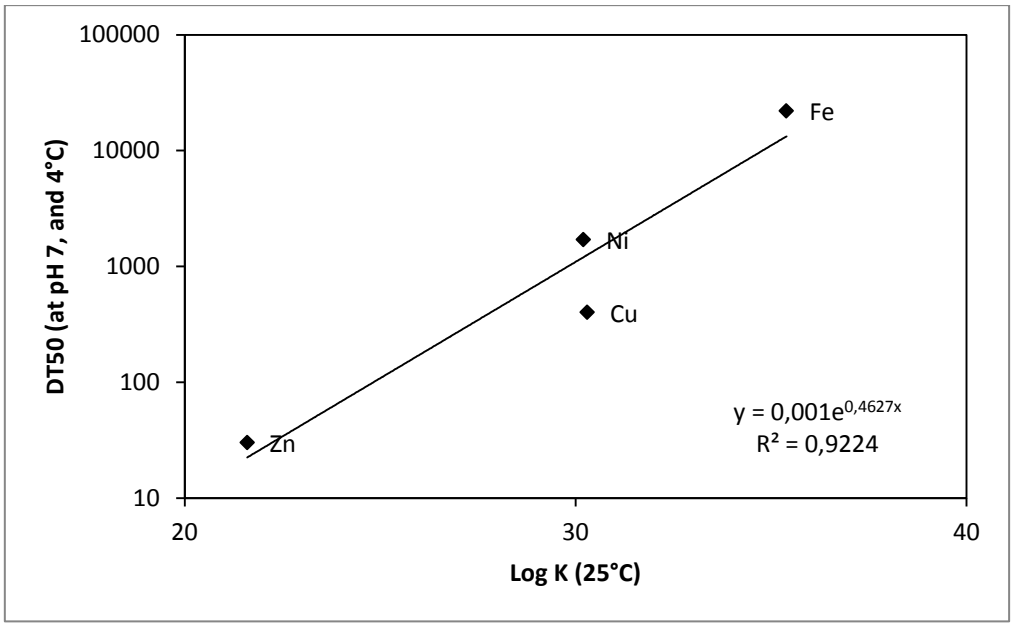

Figure 1 Relationship between degradation rate, at pH 7 and 4°C, and stability constant at 25°C between several metal cyanide compounds.

The decomposition of the silver cyanide substances in the environment is likely to be slower than in an STP, due to lower levels of aeration and biological activity, although silver cyanide compounds would still be expected to have decomposed significantly within a number of days.

For silver cyanide substances it is likely that a significant proportion of the cyanide compound would be decomposed during STP treatment, due to the aeration of the activated sludge process and the possibility of microbial degradation of cyanide (where the microorganisms are adapted to cyanide discharges). The silver released from the cyanide compound would be expected to behave in the same manner as ionic silver from other

sources. It is possible that the formation of $AgS_{(s)}$ precipitates during sewage treatment could serve to increase the rate of decomposition of the cyanide complex due to the reduction in the free silver ion activity caused by the precipitation of $AgS_{(s)}$, analogous to the removal of CN^- by the volatilisation of HCN. It is therefore likely that precipitation as $AgS_{(s)}$ in the sewage sludge is the fate of a significant proportion of silver entering biological sewage treatment facilities as silver cyanide substances.

Consequently, it is considered appropriate to treat silver cyanide substances which are emitted to the environment via a municipal STP, or other form of biological wastewater treatment, in the same manner as emissions of ionic forms of silver. It is therefore recommended that the PNEC values are read across from the dossier submitted for silver.