Abstract
2,4,7,9-Tetramethyl-5-decyne-4,7-diol (TMDD) is a non-ionic surfactant which is preferentially used as defoamer in paints and printing ink and for the treatment of surfaces. Effluents of wastewater treatment plants (WWTPs) have been identified as the domination point sources for TMDD in rivers since the removal rate of the compound in the WWTPs is in general less than 70%. However, the dominating entry pathways of TMDD into the sewage were unknown so far. In this study effluents from both, municipal WWTPs with and without treatment of indirect industrial dischargers and from industrial WWTPs with direct discharge of wastewater into receiving rivers were analyzed for the first time to identify the proportions of TMDD coming from domestic wastewater and from various industrial sources. Moreover, rivers were samples before and after the influent of sewage water from WWTPs. The TMDD concentrations in the water samples were measured using solid phase extraction (SPE) followed by gas chromatography/mass spectrometry (GC/MS). High TMDD concentrations were found in rivers (up to 63.5 _g/L), and in effluents of WWTPs (up to 310 _g/L) affected by wastewater from paper recycling industry and factories producing paint and printing ink. Concentrations of TMDD revealed to be far higher in wastewater from factories processing recycled paper (up to 113 _g/L) compared to wastewater from factories not processing recycled paper (0.066 _g/L). The results indicate that the use of recycling paper in the paper production process is the dominating reason for increased TMDD concentrations in wastewaters and receiving rivers due to the wash out of TMDD from the paper impregnated with printing ink. Very high TMDD concentrations (up to 3300 _g/L) were also detected in wastewater from a printing ink factory and a paint factory.