Analysis for the Changes of Anionic Surfactants Concentrations in Rivers of Hyogo Prefecture during Past 25 Years and the Effect of Sewerage Development

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Surfactants are hugely used as major component of detergent in daily life. Therefore, surfactant concentrations in rivers reflect sensitively the change of pollution loads from domestic field. In this study, the pollution of anionic surfactants occupying the most production in Japan was analyzed statistically during past 25 years in rivers of Hyogo Prefecture, western Japan, by using approximately 10,000 monitoring data of MBAS (Methylene Blue Active Substances; an indicator of anionic surfactants in river waters). And then the effect of sewerage development to the decrease of MBAS was studied.

Long-term decreases of MBAS concentrations were observed at most of 86 monitoring points in 65 rivers of the prefecture. From the ratio of the average MBAS in 1997-99 to that in 1979-81, it was shown that only 5 monitoring points (6%) indicated the ratio over 1 and the numbers of monitoring point with the ratio of 1-0.1, 0.1-0.01 and 0.01-0.001 were 45 (52%), 30 (35%) and 6 (7%) points, respectively (total average of ratio; 0.33). Yearly change of frequency distribution for annual average MBAS concentration at each monitoring point revealed a clear shift to lower concentration level. The proportion of monitoring point with high concentration level over 1mg/L became negligibly small in the last half of 1990s, compared with approximately 20% in the first half of 1980s.

On the other hand, the decrease patterns of MBAS at the monitoring points with high concentration level at the time of 1970s corresponded to the increase patterns of sewerage development in the cities where the points were located. The sewage treatment systems in the prefecture developed rapidly from the last half of 1980s, particularly in the coastal cities along the East Seto Inland Sea, whereas domestic production of anionic surfactants continued to increase until 1992. Therefore, it was recognized that the major cause for the decrease of MBAS in rivers of the prefecture was the development of sewerage. This was supported by the estimation for the change of environmental loads of anionic surfactants in these cities.

However, the analysis also indicated that the sewerage development over 90% was needed in order to drop MBAS concentrations in river waters to the water quality standard level for drinking water of 0.2mg/L. This fact suggested that the reduction of pollution loads to rivers and seas was not readily attainable.