

Isomeric-specific analysis of 4-nonylphenols in water samples by high resolution separation technique, GC-PFC: International comparison of nonylphenols pollution in hydrospheric environment between USA and Japan

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Introduction :

A commercial nonylphenol (NP) is widely used as surfactants in detergents, paints, emulsifying agents, pesticides as well as in the manufacture of paper, fiber, metal and agricultural chemicals. There are theoretically 35 kinds of isomers in 4-nonylphenols, structurally caused from 4-nonyl side-chain on phenol. We previously tried to analyze NP by HPLC and to get one broad peak on a chromatogram, and to get approximately ten peaks by capillary GC. All peaks on the chromatogram were confirmed to be identified as isomers each others by mass spectrometry. After our HPLC work, we also tried to isolate preliminarily 10 HPLC-fractions, to assay them for estrogenic activity by recombinant yeast screen system, subsequently to get a result on the different activity for the 10 fractions. In our present study, we separated 14 isomers from NP by two dimensional GC equipped with preparative fraction collector (GC-PFC) to assay them for the estrogenic activity. We applied the above-mentioned method to determination of NP in water samples including dissolved phase and adsorbed bed into suspended particulate materials collected from several rivers in Kentucky, USA and from Lake Kitaura, Japan.

Materials and Methods:

The NP (CAS No, 28315-32) was purchased from Kanto Chemical Co. Japan. Before GC-PFC work, the NP of 3000 ppm in hexane was separated 6 fractions by HPLC, eluting with mixture of hexane and ethyl acetate (30:1) running on the column with normal phase silica gel. The high resolution GC-MS with DB-5 column was used for study on preparative conditions and identification of isomers. The GC-PFC analysis was carried out for further separation and purification of isomers from each HPLC fractions of NP. For environmental samples, Sep-Pak solid phase and successively Silica Gel column were applied before HPLC work. The environmental samples in USA were collected by one of our author, Dr. Loganathan.

Result and Discussion:

In our present work, 14 isomeric compounds were separated from NP by GC-PFC. The international comparison of NP-pollution in hydrospheric environment between USA and Japan will be discussed.