Acute aquatoxicity screening of cellulosic products contained glyoxal, using multi-strain bacteria, daphnia, and zebrafish embryos

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Introduction

Natural organic polymer

EU CLP legislation (EC 1272/2008)

The European parliament and the council of 16 December 2008 on classification, labelling and packaging (CLP) of substances and mixtures

Cellulosic products

Figure source: Samsung fine chemicals

Modification

Classifying obligation for mixture involving polymer compounds

Application to the industry

For reflecting the client demand

Materials & methods

Target cellulosic product

2-hydroxypropyl methyl ether (cellulose, CAS-N. 9004-65-3)

Sample | Viscosity (mPas) | pH | Mixture (%) | NaCl (%) | Methoxyl (%) | Hydroxypropyl (%) | Total glyoxyl (%) |
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- ≤ 1.0 % of glyoxal is contained in commercial cellulosic products
- Cellulosic products contained ≤ 1.5 % of glyoxal were used as a test sample

Results & discussions

(2) Cyanobacteria growth inhibition test

(3) Daphnia magna acute toxicity test

(4) Zebrafish embryo toxicity test

Materials & methods

Eco-toxicity screening

(1) MARA test

(2) Cyanobacteria growth inhibition test

(3) Daphnia magna acute toxicity test

(4) Zebrafish embryo toxicity test

Conclusions

- Our results indicated that commercial cellulosic products which is contained ≤ 1 % of glyoxal is no toxic on 3 different aquatic organisms.
- However, high concentration of glyoxal more than 1 % may be one of potential hazard factors in a cellulosic products.
- Further research about the chronic effects by long-term exposure is need to more understand the action and its mechanism on aquatic toxicity.

Eco-toxicity assessment

Step 2

Eco-monitoring of cellulosic mixtures
- Chronic effects and bioaccumulation considering to environment exposure scenario

Step 3

Ecological safety assessment
- Estimation of mechanism of toxicity and calculation of criteria maximum concentration (CMC)

Application to the industry

- Exploration of potential hazard factors
- Toxicity screening for mixtures
- Application of toxic or hazard information