EVALUATION OF ECOTOXICOLOGICAL BEHAVIOUR OF POORLY WATER-SOLUBLE SURFACTANTS

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Surfactants are widely used in household and industrial cleaning detergents, personal care and pharmaceuticals products. Due to their extensive usage, surfactants can be a possible toxicant when large quantity enters the environment *via* river and wastewaters. Therefore, it is important for all new surfactants to have product safety datasheet, which includes the environmental protection parameters, *i.e.* biodegradation and ecotoxicity. Some surfactants are poorly soluble in water and they are also discharged into the waterways just like other soluble surfactants. This means the ecotoxicological behaviour (biodegradability and ecotoxicity) of poorly water-soluble substances should be assessed and have the same product safety datasheet as soluble surfactants.

Previously, MPOB had already offered several services to evaluate the ecotoxicological behaviour of surfactants, but all these methods are only applicable to water-soluble surfactants. Therefore, new methods need to be established to evaluate the biodegradability and ecotoxicity of poorly water-soluble surfactants.

THE SERVICES

Ecotoxicity Test

The ecotoxicity value of a surfactant is determined using OECD 209, activated sludge, respiration inhibition test method (OECD 209, 2010). This is a rapid screening test to identify substances that have unfavourable influence on microorganisms in sewage treatment plant and also to identify non-inhibitory concentration of test substances applicable for biodegradation test (*Figure 1*).

Biodegradation Test

The rate of degradation is measured using OECD 301C, MITI (I) (Ministry of International Trade and Industry, Japan) test method (OECD, 1992). The inoculum used is activated sludge received from 10 different sampling sites such as sewage treatment plants, industrial waste water treatment plants, rivers, lakes and seas in the Klang Valley, Malaysia.

The biodegradability of surfactant is calculated by measuring the oxygen consumed by the surfactant for 28 days in a darkened, enclosed respirometer under aerobic conditions (*Figure 2*).

$$I_{TI} = 100 - \frac{(R_{TI} * 100)}{R_C}$$

I_{TI} = inhibition of respiration [%]

R_{TI} = O_2 respiration rate of test item solutions [mg(O_2) litre^{-1} hr^{-1}]

R_C = O_2 respiration rate of control (mean) [mg(O_2) litre^{-1} hr^{-1}]

Eq. 1: Calculation of the inhibition of respiration

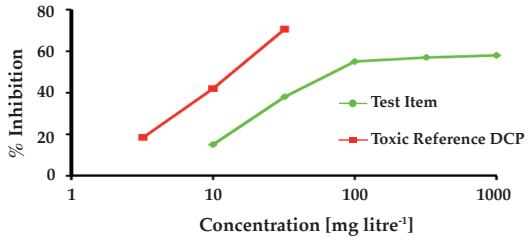

Figure 1. Set-up for ecotoxicity test.

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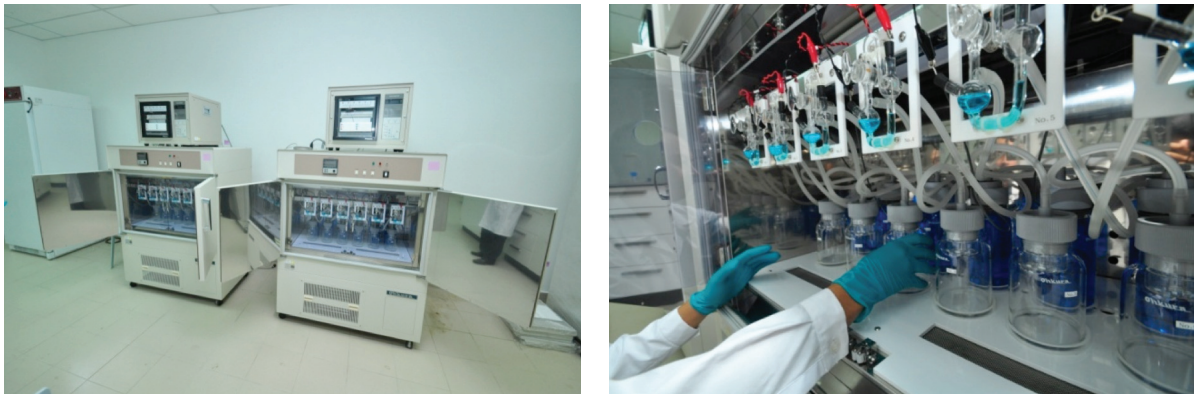

Figure 2. Coulometer used to measure biodegradation.

ADVANTAGES

- The data obtained can be used not only for the purpose of chemical safety handling, but also in the determination of the risk posed by poorly water-soluble substances to the environment;
- The data are required under European regulation, *i.e.* Registration, Evaluation, Authorisation and Restriction of Chemicals (EU-REACh) and registration of products at the European Chemical Agency (ECHA) for market access in Europe;
- The service is not only limited to surfactant, but can also be used for other poorly soluble substances; and
- This service will be offered to the relevant industries, researchers and product manufacturers.

Minimum amount of surfactant sample required: 250 ml or 50 g. The test report will be ready within six weeks.

REFERENCES

OECD (1992). *Guideline for testing chemicals: Ready biodegradability*. Organisation for Economic Co-operation and Development, Paris.

OECD 209 (2010). *Guideline for testing chemicals: Activated sludge, respiration inhibition test (carbon and ammonium oxidation)*. Organisation for Economic Co-operation and Development, Paris.

SERVICE CHARGES

Service	Charge per sample*
Ecotoxicity Test (OECD 209, activated sludge, respiration inhibition test method)	RM600
Biodegradation Test (OECD 301C, MITI test method)	RM3500

Note: *The above price may change without prior notice.

For more information, kindly contact:

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