1st Stakeholder Consultation – Questionnaire for indium phosphide (CAS 22398-80-7; EC 244-959-5)

Abbreviations and Definitions

EEE Electrical and Electronic Equipment

Background

The Oeko-Institut and Fraunhofer IZM have been appointed by the European Commission, within a framework ontract, among others to support the review of the list of restricted substances and to assess seven substances with a view to their possible future restriction under Directive 2011/65/EU (RoHS 2).

Indium phosphide was specified in the project terms of reference for a detailed assessment. Initial substance information for indium phosphide is compiled and available on the substance specific webpage of the stakeholder consultation (http://rohs.exemptions.oeko.info/index.php?id=292).

The questions below outline the need for information.

Questions

1. Applications in which indium phosphide is in use

a. Please provide information concerning products and applications in which the sub-

stance is in use.

i**. [3SPT] The InP is used as active material for the high-power (300-600mW) single mode pump laser & high bit rate (10-25Gb/s) single mode integrated laser chips produced by our company. The field of application concerns 100-400Gb/s telecommunications link either in Raman amplifiers or in nx10Gb/s or nx25Gb/s transceivers. These application are relevant to the EEE products. The InP is also used as an active material for photo-detection applications from continuous wave to 25Gb/s dynamical range in military applications or in telecommunications networks.**

ii**. [3SPT] Due to the specific properties of the InP crystal, this material cannot be substituted in order to reach requested performances. In particular, InP is responsible for the emission wavelength of the laser chip or the detection wavelength of the photo-diode at 1.30µm or 1.50µm ranges. The wavelength windows are determined by the minimum absorption windows of silica which is the key material of optical fibers used in telecommunications networks.**

iii. **[3SP] Not applicable.**

b. Please specify if you are aware, if aside from actual use of the substance, it may be re-introduced in to the material cycle through the use of secondary materials.

[3SP] Not applicable.

c. Please specify in which applications indium phosphide is used as a material constituent, as an additive or as an intermediate and what concentration of indium phosphide remains in the final product in each of these cases (on the homogenous material level).

[3SP] For the diode laser semiconducteur at 1.3 µm or 1.5 µm, indium phosphide is a material constituent and the concentration is closed to 100%

2. Quantities and ranges in which indium phosphide is in use

[3SP] We use less than 100 kg

3. Potential emissions in the waste stream

3SP manage the waste containing indium phosphine in a specific waste treatment : incineration. 3SPT collect gallium arsenide, indium phosphine with the same waste treatment.

4. Substitution

a. Please provide details as to the substitution of indium phosphide:

i **[3SPT] InP is firstly used as a raw material in the form of single crystal wafers with diameter ranging from 50mm (2 inches) to 100mm (4 inches). This raw material is the substrate for epitaxial process of semi-conductor alloys layer such as GaInAsP or GaInAlAs grown by Gas Source-Molecular Beam Epitaxy (GS-MBE) or Metal-Organic Vapour Phase Epitaxy (MOVPE). There is no other known binary III-V compound single crystal with the same lattice constant that might be considered as an alternative (GaAs, GaP & InAs lattice parameter differ too much of InP one so that InP dislocation free layers are not possible to be grown by GSMBE or MOVPE). Absence of dislocation is key to obtain reliable InP based semiconductor devices.**

ii. **[3SPT] In the field of laser for telecommunications or industrial application in the spectral range of 1250nm-1630nm, there is no alternative on the substance level nor at technological level.**

iii. **[3SPT] Not applicable (cf. above).**

5. Socio economic impact of a possible restriction

If indium phosphide is to be restricted under RoHS, 3SPT can not continue its semiconductor laser diode manufacturing activity 1.3 - 1.5 µm : more than 10 M€.