ENVIRONMENTAL EFFECT ASSESSMENT OF ORGANIC PBT COMPOUNDS

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Abstract. PBT is the abbreviation of persistent, bioaccumulating and toxic compounds (materials); vPvB chemicals are very persistent, very bioaccumulating compounds. Both type of materials exist for a longer period in the environment. These all are persistent organic pollutants (POP) that disperse in the environment and exert effect on distant territories too. PBT or vPvB? Difference is not so sharp in the reality. Dangers source from bioaccumulation and/or biomagnification (multiplicative effect) after or during bioaccumulation period. Scientific and civil communities have to think on acceptability of these chemicals else more than half of existing compounds should be excluded from daily usage. There are additional dangers of chronic exposure that can cause unrequested side effects, destroy integrity of endocrine system and can be hardly measured by conventional tests. We composed a preliminary PBT assessment methodology as a possible first approach to determine the PBT properties of an organic compound with the aspect of determining direction of further investigations. Importance and application of PBT assessment: we can predict the real danger of compounds not tested yet without additional costs and in short time considered to be as an advantage of the approach, especially in case of non-existing data. This method is more exact than traditional ones because applying just risk factors can be overt based on precautionary principles. An overt application of risk factors can restrict the broad application of a compound. Assessing existence of PBT danger as a part of hazard evaluation of compounds are based on PBT aspects that can be done with help of (Q)SAR-models (Quantitative/Qualitative Structure Activity Relationship) and/or applying PBT-vPvB criteria and/or EPIWIN and additional programs in case of non-existing experimental and monitoring data. We consider some aspects of REACH (new European chemical regulation) requirements too.

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1. Introduction

PBTs are persistent, bioaccumulating, toxic compounds; vPvB chemicals are very persistent, very bioaccumulating compounds, delay for a longer period in the environment. These are persistent organic pollutants (POP). PBT or vPvB: If a chemical refers to a P or vP criteria, then it has long environmental half-life and exert a potential danger to the environment. It conclude in a detrimental or deleterious effect sourcing from a chronic exposition that can not predicted by standardized laboratory tests. Dangers of chronic exposition: organism tries to get rid of xenobiotics but during this time occur an accumulation of material and/or any effect. It can decrease the ability (power) of immune system and/or cause erroneous signalization and additional unrequested side effects. Our chosen example case PCB-77. It can danger the integrity of endocrine system. Dangers to the environment: disperse in the environment, exert effect on distant territories too. Where will they accumulate and on what kind of living organisms they exert a deleterious effect? If toxic material is not just persistent in the environment, but bioaccumulating too, then expositional potential exerted on living organisms of higher trophic level is higher. Dangers source from bioaccumulation and/or biomagnification (multiplicative effect) after or during bioaccumulation periode. Application and importance of PBT assessment: we can predict the real danger of compounds not tested yet without additional costs assessment in case of non-existing data (OECD, 2005). Characteristics of PBT assessment: Presently, this kind of assessment does not cover all possibly affected organisms, just some key organisms but after clarification of toxicity rules will be available and extendable to additional organisms. This method is more exact than traditional approach, applying just risk factors that can be overt based on precautionary principles. An overt application of risk factors can lower the broad application of a compound. Applying it less than necessary will increase the risk. Assessing existence of PBT danger: Possibility of assessing dangerousness of compounds are based on PBT international criteria (Q)SAR-models (Quantitative/Qualitative Structure Activity Relationship), already existing data of the same (similar) compounds and/or applying PBT-vPvB criteria (Tables 1 and 2) and/or EPIWIN and additional programs (Epiwin, 1986). Practical approach: applying all of the above mentioned ones at the same time.