A Chemical Activity Approach to Exposure and Risk Assessment of Chemicals

To support the goals articulated in the vision for exposure and risk assessment in the twenty-first century, we highlight the application of a thermodynamic chemical activity approach for the exposure and risk assessment of chemicals in the environment. The present article describes the chemical activity approach, its strengths and limitations, and provides examples of how this concept may be applied to the management of single chemicals and chemical mixtures. The examples demonstrate that the chemical activity approach provides a useful framework for 1) compiling and evaluating exposure and toxicity information obtained from many different sources, 2) expressing the toxicity of single and multiple chemicals, 3) conducting hazard and risk assessments of single and multiple chemicals, 4) identifying environmental exposure pathways, and 5) reducing error and characterizing uncertainty in risk assessment. The article further illustrates that the chemical activity approach can support an adaptive management strategy for environmental stewardship of chemicals where “safe” chemical activities are established based on toxicological studies and presented as guidelines for environmental quality in various environmental media that can be monitored by passive sampling and other techniques.

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