
SciPinion Expert Panel Finds Significant Flaws in Publication on Polymer Biodegradation and Emissions

Panel Concludes Polyvinyl Alcohol is Biodegradable

BOZEMAN, MT (April 21, 2023) – SciPinion, the leading independent scientific review community committed to the unbiased evaluation of published science for the public and private sectors, released the following evaluation of a 2021 paper published in the International Journal of Environmental Research and Public Health.

Executive Summary

On June 3, 2021, a publication¹ theorized that water-soluble film made from polyvinyl alcohol (also known as PVA and PVOH) used in unit-dose laundry products, known as laundry pods or capsules, is not fully removed in wastewater treatment plants and subsequently enters the aquatic and terrestrial environment via sludge where it poses a hazard. This single publication was promoted heavily on social media, leading to questions including ‘what are laundry pods made from?’, ‘are laundry pods made of plastic?’, and ‘do laundry pods create microplastic pollution?’. It was also shared with regulators in a petition asserting that unit-dose laundry PVA film may be unsafe for the environment and should be subject to restriction.

The published paper was funded by a company that markets laundry detergent backed by “plastic-free” claims which is based on not using water-soluble films. This company further utilized the Rolsky and Kelkar publication to support an aggressive online marketing campaign and a petition with the United States Environmental Protection Agency (US EPA) to “require health and environmental safety tests under the Toxic Substances Control Act” on PVA and “ultimately regulate PVA as a toxic substance, pending the results from testing.” Since PVA is currently designated by US EPA Safer Choice Program as “green circle” indicating that it is environmentally safe, the findings of Rolsky and Kelkar are contrary to current weight of evidence for the environmental safety of PVA.

SciPinion, which objectively engages the global scientific community to analyze scientific topics, conducted an independent expert peer review of the Rolsky and Kelkar paper and its modeling approach to determine if the work was of sufficient quality to warrant newfound concerns for polyvinyl alcohol (PVA/PVOH). SciPinion utilized its proprietary approach² to recruiting and engaging experts in a manner that has been shown to yield reproducible effects.³ This involves selecting experts using an objective and transparent process and engaging the experts in a manner that keeps them blinded to each other and to

¹ Rolsky C, Kelkar V. Degradation of Polyvinyl Alcohol in US Wastewater Treatment Plants and Subsequent Nationwide Emission Estimate. Int J Environ Res Public Health. 2021 Jun 3;18(11):6027. doi: 10.3390/ijerph18116027. PMID: 34205161; PMCID: PMC8199957.

² <https://scipinion.com/peer-review-process/>

³ Kirman CR, Simon TW, Hays SM. Science peer review for the 21st century: Assessing scientific consensus for decision-making while managing conflict of interests, reviewer and process bias. Regul Toxicol Pharmacol. 2019 Apr;103:73-85. doi: 10.1016/j.yrtph.2019.01.003. Epub 2019 Jan 8. PMID: 30634024.

the sponsor of the review. SciPinion recruited across a large population of researchers and engaged eight high-quality experts in biodegradation of plastics and wastewater treatment processes to review the Rolsky and Kelkar paper.

The experts found that Rolsky and Kelkar's approach had significant flaws. The experts concluded the actual degradation of PVA in the real world will be much higher than predicted by the Rolsky and Kelkar model. There was a clear consensus amongst the panel of experts that PVA should be considered readily biodegradable. The findings from the panel of experts confirms the current regulatory designation of PVA as readily biodegradable is correct, that PVA should be largely removed by wastewater treatment plants and therefore should not build up in the environment.

Rolsky Publication Overview

Rolsky and Kelkar (2021) estimated US emissions of PVA resulting from domestic use of soluble laundry and dish detergent packets, corroborated by an online consumer survey and a literature review. The authors estimated that approximately $17,200 \pm 5,000$ metric ton units per year (mtu/yr) of PVA are used, with $10,500 \pm 3,000$ mtu/yr reaching wastewater treatment plants. The authors further estimated that ~61% of PVA ends up in the environment *via* sludge, and ~15.7% *via* the aqueous phase.

SciPinion and Assembled Expert Panel

The panel of eight scientists recruited by SciPinion are globally recognized experts in biodegradation and modeling of degradation processes in wastewater treatment plants. All eight have a doctoral degree, with two from the United States, four from European countries, one from the African continent, and one from Southeast Asia. The expert panel has a combined 196 years of experience and 1,886 publications.

Panel Findings

Rolsky and Kelkar (2021) contains significant flaws

Overall, experts gave the Rolsky study a low-medium rating of 3.9 out of 10 with major flaws in the assumptions and modeling used. The experts were highly critical of the methods used to survey for detergent packet use in the United States and in the extrapolation of laboratory-based degradation rates of PVA to a model of actual wastewater treatment plant operations.

Actual biodegradation is much higher than predicted by Rolsky

A clear majority of the panelists (6/8) believe that actual biodegradation would be higher or much higher than predicted by Rolsky and Kelkar. Experts noted that the study did not use EPA's own guidance on how to scale degradation rates from laboratory-based studies to modeling of full-scale wastewater treatment plant operations. The Rolsky and Kelkar paper

predicted only 1.5% - 20% of PVA would be degraded in treatment plants. In contrast, expert panelists noted that degradation may be extremely high in treatment plants.

Is polyvinyl alcohol (PVA/PVOH) biodegradable?

Panelists came to a near consensus (7/8) that PVA should receive a “pass” grade as biodegradable following both US EPA and European Union guidance. A “pass” is considered by regulatory agencies to indicate that a compound will be effectively removed in wastewater treatment plants and thus unit-dose laundry products (pods or capsules) would not create pollution.

Conclusions

The SciPinion panel of experts found that the Rolsky and Kelkar paper contains significant scientific flaws. Given the high degree of consensus amongst the panel of experts, SciPinion concludes:

- The Rolsky and Kelkar (2021) paper should not be given much credibility for informing the degradation of PVA in the real world and therefore insufficient for consideration when informing science-based regulatory decisions.
- The available evidence suggests PVA is readily biodegradable, very little will pass through wastewater treatment plants without being fully degraded, and PVA is not likely to accumulate in the environment.

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SciPinion was created with the mission to help companies, governments, and consumers make better decisions by understanding the collective wisdom of the world’s experts, and to make science more trusted by all. Far too often, important debates about important scientific issues are inflamed by activists, competing research groups, or sometimes simply because the science on a specific issue has some uncertainty. That type of environment can lead to reactionary decisions by regulators or can fuel litigation. In some situations, experts who share their opinions on these controversial topics are attacked. By creating an environment whereby experts can share their opinions in a psychologically safe environment, SciPinion has created a safe haven for experts to share their true opinions without influence and we are putting this to work to help inform the most important science issues facing society. Learn more about our [process and philosophy here](#).