

TITANIUM DIOXIDE

September 22, 2021



Titanium Dioxide
Stewardship Council

Project Scope

The Titanium Dioxide Stewardship Council (TDSC) agreed to undertake a voluntary, self-funded project to test for the presence of any unintentional PCBs in TiO₂ its members produce by the chloride process and sell into the following end-use markets in the United States: paints and coatings, paper and paperboard, and plastic.

A total of 13 unique grab samples of TiO₂ were collected for analysis by US EPA Method 1668C.

Method 1668C was designed for analysis of PCBs in environmental matrices like groundwater, surface water, and soils and has not been validated for commercial products like TiO₂.

Sample Collection Procedure

Quality Assurance Project Plan (QAPP) “*Evaluation of the Presence of Polychlorinated Biphenyls in Titanium Dioxide*”.

A project-specific Standard Operating Procedure (SOP) for collection of the TiO₂ samples was developed so that consistent and uniform procedures were used by the TDSC companies.

TDSC member company personnel responsible for sample collection were trained in the application of the SOP, chain-of-custody procedures, and shipping and handling of the samples for return to the analytical laboratory.

Sample Collection Procedure

Samples were collected where the product was being bagged at TDSC plant facilities.

A field blank was collected at each sample location to monitor for ambient PCB contamination.

Strict chain-of-custody procedures were followed from sample supply kit preparation through sample collection and return shipment of the samples to the analytical laboratory.

Laboratory quality control samples included analysis of laboratory method blanks and duplicate samples.

Results

Total PCBs ($\mu\text{g}/\text{kg}$ or ppb)					
Statistic	Field Blanks	ALL TiO ₂ Samples	Paint and Coatings	Paper and Paperboard	Plastic
Average	0.035	1.046	1.458	0.086	0.907
Median	0.008	0.122	0.173	0.074	0.0790
Sample Count	13	13	6	4	5

Estimates in Products

The samples analyzed in this study are the bulk TiO₂ product sold as an ingredient for use in paint and coatings, paper and paperboard, and plastic in North America.

Commercial Product End-Use Type	Average TiO ₂ Total PCB Concentration (µg/kg or ppb)	Typical TiO ₂ Amount Used in the Product (by weight)	Estimated PCB Concentration in Commercial Products (µg/kg or ppb)
Paint and Coatings	1.458	0.2 to 50%	0.003 to 0.73
Paper and Paperboard	0.086	1 to 40%	0.0009 to 0.034
Plastic	0.907	1 to 20%	0.009 to 0.18

Comparison with WA Ecology

Commercial Product End-Use Type	WA Ecology (µg/kg or ppb)	Estimate from TDSC Study (µg/kg or ppb)
Paints/Coatings/Dyes	22	0.003 to 0.73
Paper and Paperboard	2.7 to 47.5	0.0009 to 0.034
Plastics	144.4	0.009 to 0.018

Extremely low levels are consistent with findings of Hu and Hornbuckle (2010), who used EPA 1668A (an earlier version) and found no PCBs in inorganic pigments, including TiO₂.

Hu, D., and Hornbuckle, K.C. 2010. Inadvertent Polychlorinated Biphenyls in Commercial Paint Pigments. *Environmental Science & Technology* 44:2822-2827.

State of Washington Department of Ecology. Polychlorinated Biphenyls in Consumer Products. Publication No. 16-04-014. November 2016. <https://apps.ecology.wa.gov/publications/documents/1604014.pdf>.

The categories "Paints/Coatings/Dyes" and "Plastics" are product categories from the Washington Ecology report referenced above. "Paper and Paperboard" in the table above includes the Washington Ecology average for "Comic Books" (2.7 ppb) and "Containers/Boxes" (47.5 ppb).



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