

PC: 800126
CAS 13463-67-7MEMORANDUM

13 May 96

SUBJECT: Titanium Dioxide as an "Inert" Protectant Against UV light--Exemption from a Tolerance

Inert Chemical Code: 999999.

DP Barcode: D224980. Case 287375, ID#: 6E04675

TO: Kerry Leifer and Amelia Acierto, PM Team 45, RSB-RD (7505W)

FROM: Alex T. Clem, Environmental Scientist, CR3, EFGWB (7507C)

THRU: Akiva D. Abramovitch, Ph.D., Head, CR3, EFGWB (7507C)

Henry M. Jacoby, Chief, EFGWB/EFED (7507C)

Proposed Use. The only use information given to EFGWB is that ZENECA Ag Products is requesting an exemption from a tolerance for titanium dioxide ("synonyms": rutile, anatase, brookite) when it is used as a "UV protectant" in pesticide formulations. Concentrations at up to 3% by weight of any or all possible formulations of any pesticide could be used on growing crops.

Environmental Fate Executive Summary

This use of titanium dioxide will have a negligible foreseeable effect on the natural, preexisting environmental (biogeochemical) cycles and concentrations of this mineral (inorganic) compound.

Environmental Fate

Basis of Assessment. *The Branch has drawn from its own resources and agricultural experience. No environmental fate information was provided in the "data" package and EFGWB requires none from the registrant.*

Environmental Fate Assessment. Titanium minerals, including forms of titanium dioxide (TiO₂), are abundant in the earth's crust and soils. Natural ore-grade deposits of titanium dioxide (rutile) testify to its geologic permanence. Typical soil concentrations of titanium in its various chemical forms range from about 0.1 to 1% (1000 to 10,000 ppm). A "selected" concentration for total titanium in soil chosen by Lindsay (Lindsay, 1979) is 4000 ppm. Comparable values are given by other authors (Emsley, 1991; Sposito, 1989). Some Hawaiian soils have titanium dioxide (anatase) concentrations of up to 25% (Tamura et al, 1955). The various oxides of titanium represent the thermodynamically most stable or "climax mineralogical forms" of titanium in soils (Sposito, 1989). There is no evidence that titanium minerals are toxic to plants in the pH range of agricultural soils (Chapman, 1966).

After its application to agricultural soils, TiO₂ will behave like a finely-divided, insoluble



2078906

landscape mineral. For any foreseeable uses in pesticide formulations at up to 3% by weight (which would correspond to typically less than extra 1 ppm in soil if incorporated to a depth of six inches), it would take of the order of thousands of years to even begin to significantly change soil concentrations. Even then there are other equilibrium processes which serve to limit any potential excursions from local, ambient concentrations. That is, any available solution species of titanium would convert to near natural background levels of numerous ever-present solvated or complex ions containing titanium or into other insoluble minerals forms.

Environmental Impacts. In conclusion, any environmental change associated with this use of titanium dioxide is insignificant when compared to the quantities ever-present in the environment and the mineral buffering capacity of natural soils and waters. Therefore, any ground or surface water effects are negligible. Likewise, no significant difference in the accumulation of titanium moieties in plants or animals is expected to occur.

REFERENCES

Chapman, H.D., Editor. 1966. Diagnostic Criteria for Plants and Soils, pps. 478-479. Quality Printing Co., Inc.; Abilene, Texas. (Chapter 31 by Pratt, P.F.; Dept. of Soils and Plant Nutrition, University of California Citrus Research Center and Agricultural Experiment Station, Riverside.)

Emsley, J. 1991. The Elements. Oxford University Press, New York.

Lindsay, W.L. 1979. Chemical Equilibria in Soils. John Wiley & Sons, Inc., New York.

Sposito, G. 1989. The Chemistry of Soils. Oxford University Press, Inc., New York.

Tamura, T., M.L. Jackson, and G.D. Sherman. 1955. Mineral content of a latosolic brown forest soil and of a humic ferruginous latosol of Hawaii. Soil Sci. Soc. Amer.. Proc. 19: 435-439.