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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Evaluation of Pentachlorophenol Purification Procedure submitted by Pazianos Associates 1/16/84

FROM: Nancy Dodd, Chemist *Nancy Dodd*
Residue Chemistry Branch
Hazard Evaluation Division (TS-769)

THRU: Charles L. Trichilo, Chief
Residue Chemistry Branch
Hazard Evaluation Division (TS-769)

TO: Paul R. Lapsley, Chief
Special Review Branch
Registration Division (TS-767)

The method (U.S. Patent #4,228,309) is as follows: Pentachlorophenol is reacted with a 3% sodium hydroxide solution to form sodium pentachlorophenate. Cyclohexane is used to extract the dibenzofuran and dioxin impurities from the aqueous sodium pentachlorophenate solution until the desired purity is reached. Cyclohexane and sodium pentachlorophenate are separated. The cyclohexane is distilled off and condensed for recycling while the remaining impurities in a small amount of cyclohexane are destroyed by ultraviolet light catalyzed dehalogenation. The sodium pentachlorophenate is reacted with hydrochloric acid to precipitate pure PCP from the sodium chloride solution. The sodium chloride solution is purified by passing through an activated carbon bed.

The patent #4,228,309 states that technical pentachlorophenol contains approximately 2000 ppm octachlorodibenzo-p-dioxin and other chlorodibenzo-p-dioxins in amounts of 1% or less of the amount of OCDD.

The Mississippi State University data shows that levels of OCDD in aqueous solutions of NaPCP can be reduced from levels of 1720 mg OCDD per kg PCP to levels of 20 mg OCDD per kg PCP (20 ppm) by means of 8 solvent extractions with cyclohexane. OCDD levels in filtered Na PCP solutions could be reduced from 499-589 mg/kg to 0.3-0.5 mg/kg in 6 extractions. Levels of OCDD in NaPCP were reduced from 1870 mg/kg to 53 mg/kg in 4 extractions with cyclohexane.

Battelle Laboratories submitted data which show that, when unfiltered NaPCP with levels of 2400 ug OCDD and 103 ug OCDF were extracted with cyclohexane, levels in the extracts decreased to 7.5 ug OCDD and 0.063 ug OCDF by the ninth extraction. Amounts of tetra-, penta-, hexa-, and hepta- CDD and - CDF also decreased.

Conclusions

We conclude that the method for cyclohexane extraction and ultraviolet light catalyzed destruction of chlorodibenzo-p-dioxins in pentachlorophenol as per U.S. Patent No. 4,228,309 does reduce levels of chlorodibenzofurans and chlorodibenzopara-dioxins. The patent #4,228,309 states that the method "also serves to remove other chlorinated impurities which are present in technical pentachlorophenol." We think that hexachlorobenzene would be also removed but no data are provided for hexachlorobenzene.

Recommendation

We still recommend that information on the feasibility of application of this purification method on an industrial scale be obtained including data on the reduction in contamination levels of HCB.

cc: R.F.
Circu
Reviewer
/PCP, S.F.

TS-769:EZ:3/38/84:RDS:3/28/84:ND:wh:3/29/84.

Pazianos Associates

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Dr. Donald Barnes
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January 16, 1984

Dera Don,

Attached to this letter are copies of a summary of a process description and other materials relating to the feasibility of producing a contaminant-free pentachlorophenol for use in wood preservation. Part of this package contains independent verification of the patented (enclosed as well) removal process by two independent laboratories - Battelle Columbus and Mississippi State University. Additionally, this package includes a summary of an extensive literature search on the destruction of the contaminants after removal. The literature search indicates that the most cost efficient and safest manner of destruction is through UV catalyzed dehalogenation.

My client, Idacon, Incorporated of Houston, Texas is the holder of the patent for the removal process, and has considerable design expertise with UV catalyzed halogenation reactions. Its studies indicate that the chlorinated contaminants in pentachlorophenol can likely be efficiently removed and destroyed at low cost.

Idacon is not a basic producer of pentachlorophenol and thus does not have sufficient economic incentive to proceed further with this project. My client would however, be interested in completing the research and engineering studies necessary to get to the stage of constructing a pilot plant if such assistance is available from the Agency.

Don, after you and staff have had an opportunity to review this material, please call me. If the Agency believes this to be a course worth further exploration, I will have my client's top management come to Washington to discuss it with you.

Many thanks for your willingness to review this material.

Warmest regards,

Sincerely,



E. George Pazianos
Agent
Idacon, Inc.

egp/mo

Recd. 1/17/84 HB