

217/782-2113

FEDERALLY ENFORCEABLE STATE OPERATING PERMIT

PERMITTEE

Nanophase Technologies Corporation
Attn: Mohammad N. Ali
1319 Marquette Drive
Romeoville, Illinois 60446

Application No.: 05090050 I.D. No.: 197090ABE
Applicant's Designation: ZINCOXIDE3 Date Received: September 23, 2005
Subject: Pilot Plant/Dispersion Facility and PVS Reactor Stations
Date Issued:
Location: 1319 Marquette Drive, Romeoville

This permit is hereby granted to the above-designated Permittee to OPERATE a pilot plant, twelve PVS reactor stations controlled by twelve dust collectors, and an oxide coating process controlled by a condenser vacuum pump, and filter pursuant to the above-referenced application. This permit is subject to standard conditions attached hereto and the following special condition(s):

- 1a. This federally enforceable state operating permit is issued:
 - i. To limit the emissions of air pollutants from the source to less than major source thresholds (i.e., volatile organic material (VOM) and hazardous air pollutants (HAPs) from the source to less than major source thresholds, i.e., VOM to less than 100 tons per year, and HAPs to less than 10 tons per year of any single HAP and 25 tons per year of any combination of such HAP). As a result, the source is excluded from the requirements to obtain a Clean Air Act Permit Program permit. The maximum emissions of this source, as limited by the conditions of this permit are described in Attachment A.
 - ii. To limit the emissions of volatile organic material from the source to less than 25 tons/year. As a result, the source is excluded from the requirements of 35 Ill. Adm. Code Part 205, Emission Reduction Market System. The maximum emissions of this source, as limited by the conditions of this permit are described in Attachment A.
 - iii. This permit is issued based upon the plant not being subject to the requirements of 35 Ill. Adm. Code 218 Subpart QQ "Miscellaneous Formulation Manufacturing Processes" and 35 Ill. Adm. Code 218 Subpart RR "Miscellaneous Organic Chemical Manufacturing Processes". This is consequence of the federally enforceable production and operating limitations, which restrict a potential to emit to less than 25 tons per year.

- b. Prior to issuance, a draft of this permit has undergone a public notice and comment period.
- c. This permit supersedes all operating permits issued for this location.
- 2a. No person shall cause or allow the emission of smoke or other particulate matter, with an opacity greater than 30 percent, into the atmosphere from any emission unit other than those emission units subject to the requirements of 35 Ill. Adm. Code 212.122, pursuant to 35 Ill. Adm. Code 212.123(a), except as allowed by 35 Ill. Adm. Code 212.123(b) and 212.124.
- b. No person shall cause or allow any visible emissions of fugitive particulate matter from any process, including any material handling or storage activity beyond the property line of the emission source unless the wind speed is greater than 40.2 kilometers per hour (25 miles per hour), pursuant to 35 Ill. Adm. Code 212.301 and 212.314.
- c. Pursuant to 35 Ill. Adm. Code 212.309(a), the emission units described in 35 Ill. Adm. Code 212.304 through 212.308 shall be operated under the provisions of an operating program, consistent with the requirements set forth in 35 Ill. Adm. Code 212.310 and 212.312, and prepared by the owner or operator and submitted to the Illinois EPA for its review. Such operating program shall be designed to significantly reduce fugitive particulate matter emissions.
 - i. All normal traffic pattern access areas surrounding storage piles specified in 35 Ill. Adm. Code 212.304 and all normal traffic pattern roads and parking facilities which are located on mining or manufacturing property shall be paved or treated with water, oils or chemical dust suppressants. All paved areas shall be cleaned on a regular basis. All areas treated with water, oils or chemical dust suppressants shall have the treatment applied on a regular basis, as needed, in accordance with the operating program required by 35 Ill. Adm. Code 212.309, 212.310 and 212.312.
 - ii. All unloading and transporting operations of materials collected by pollution control equipment shall be enclosed or shall utilize spraying, pelletizing, screw conveying or other equivalent methods.
- d. Pursuant to 35 Ill. Adm. Code 212.310, as a minimum the operating program shall include the following:
 - i. The name and address of the source;
 - ii. The name and address of the owner or operator responsible for execution of the operating program;
 - iii. A map or diagram of the source showing approximate locations of storage piles, conveyor loading operations, normal traffic

pattern access areas surrounding storage piles and all normal traffic patterns within the source;

- iv. Location of unloading and transporting operations with pollution control equipment;
 - v. A detailed description of the best management practices utilized to achieve compliance with this Subpart, including an engineering specification of particulate collection equipment, application systems for water, oil, chemicals and dust suppressants utilized and equivalent methods utilized;
 - vi. Estimated frequency of application of dust suppressants by location of materials; and
 - vii. Such other information as may be necessary to facilitate the Illinois EPA's review of the operating program.
- e. Pursuant to 35 Ill. Adm. Code 212.321(a), no person shall cause or allow the emission of particulate matter into the atmosphere in any one hour period from any new process emission unit which, either alone or in combination with the emission of particulate matter from all other similar process emission units for which construction or modification commenced on or after April 14, 1972, at a source or premises, exceeds the allowable emission rates specified in subsection (c) of 35 Ill. Adm. Code 212.321.
- 3a. Pursuant to 35 Ill. Adm. Code 218.301, no person shall cause or allow the discharge of more than 3.6 kg/hour (8 lbs/hour) or organic material into the atmosphere from any emission unit. If no odor nuisance exists the limitation of this subpart shall apply only to photochemically reactive material.
- b. In the event that the operation of this emission unit results in an odor nuisance, the Permittee shall take appropriate and necessary actions to minimize odors, including but not limited to, changes in raw material or installation of controls, in order to eliminate the odor nuisance.
- 4a. Emissions of volatile organic material (VOM) and operation of the pilot plant/dispersion facility shall not exceed the following limits:

Material	PWR			VOM		
	<u>(Gal/Batch)</u>	<u>(Per Month)</u>	<u>(Per Year)</u>	<u>Content (Lbs/Gal)</u>	<u>VOM Emissions (Tons/Mo)</u>	<u>(Tons/Yr)</u>
Solvent	300	61	608	8.34	1.52	15.19

These limits define the potential emissions of VOM and are based on maximum throughput, maximum VOM content, and a 2% loss factor.

- b. This permit is issued based on negligible emissions of particulate mater (PM) from the Pilot/Dispersion facility. For this purpose, emissions from each emission source shall not exceed nominal emission rates of 0.3 lbs/hour and 0.44 tons/year.
- c. Emissions of PM and volatile organic material (VOM) and operation of the oxide coating reactor PK-100 process 1 shall not exceed the following limits:

<u>Material</u>	<u>PWR</u> <u>(Lbs/Batch)</u>	<u>Batches</u>		<u>Emission Factor</u> <u>Stack test</u> <u>(Lbs PM/Lbs)</u>	<u>PM</u> <u>Emissions</u>	
		<u>(Per Mo)</u>	<u>(Per Yr)</u>		<u>(T/Mo)</u>	<u>(T/Yr)</u>
Zinc Oxide	1,810	110	1,095	0.059	0.05	0.5

<u>Material</u>	<u>PWR</u> <u>(Lbs/Batch)</u>	<u>Batches</u>		<u>Emission Factor</u> <u>Stack test</u> <u>(Lbs VOM/Batch)</u>	<u>VOM</u> <u>Emissions</u>	
		<u>(Per Mo)</u>	<u>(Per Yr)</u>		<u>(T/Mo)</u>	<u>(T/Yr)</u>
Ethanol	15.62	110	1,095	2.6	0.15	1.5
Silicone Oil	71.00					

These limits define the potential emissions of PM and VOM and are based on maximum throughput, material balance, 83% overall control efficiency of the condenser and vacuum pump, 95% control efficiency of the filter and stack test results.

- d. Operation and emissions of the oxide coating reactor PK-100 process 2 shall not exceed the following limits:

Silicone Oil Containing Methanol						
<u>Usage</u> <u>(Lbs/Batch)</u>	<u>Number of Batches</u> <u>(Batch/Mo)</u>	<u>(Batch/Yr)</u>	<u>VOM/HAP (Methanol)</u> <u>Emissions</u>		<u>VOM</u> <u>Emissions</u>	
			<u>(T/Mo)</u>	<u>(T/Yr)</u>	<u>(T/Mo)</u>	<u>(T/Yr)</u>
176	42	330	0.33	4.02	0.49	5.95

Metal Oxide (NonHAP)					
<u>(Lbs/Batch)</u>	<u>(Batch/Month)</u>	<u>(Batch/Year)</u>	<u>PM Emissions</u>		
			<u>(Ton/Month)</u>	<u>(Ton/Year)</u>	
1,810	42	330	0.3	2.99	

VOM limits are based on maximum production rate, estimated control efficiency of the vacuum pump and information from test report dated January 10, 2005. PM limits are based on maximum production rate, emission factor from AP-42 Chapter 6.4.1.

- e. This permit is issued based on negligible emissions of particulate matter (PM) from the twelve PVS reactor stations controlled by twelve dust collectors. For this purpose emissions from each emission source

shall not exceed nominal emission rates of 0.1 lb/hour and 0.44 tons/year.

- f. This permit is issued based on only inorganic materials being processed in the PVS reactor stations.
- 5. The emissions of Hazardous Air Pollutants (HAP) as listed in Section 112(b) of the Clean Air Act shall be less than 10 tons/year of any single HAP and 25 tons/year of any combination of such HAPs. As a result of this condition, this permit is issued based on the emissions of all HAPs from this source not triggering the requirements to obtain a Clean Air Act Permit Program (CAAPP) Permit.
- 6. Compliance with the annual limits of this permit shall be determined on a monthly basis from the sum of the data for the current month plus the preceding 11 months (running 12 month total).
- 7a. The condenser, dust collectors, and filters shall be in operation at all times when the associated equipment are in operation and emitting air contaminants.
- b. The condenser shall be maintained at the temperature as demonstrated in the most recent stack test. This temperature shall be maintained during operation.
- c. The condenser shall be equipped with a continuous monitoring device which is installed, calibrated, maintained, and operated according to vendor's specifications at all times that the condenser is in use. This device shall monitor the condenser temperature.
- 8a. Pursuant to 35 Ill. Adm. Code 212.107, 212.109, and 212.110, testing for particulate matter emissions shall be performed as follows:
 - i. For both fugitive and nonfugitive particulate matter emissions, a determination as to the presence or absence of visible emissions from emission units shall be conducted in accordance with Method 22, 40 CFR part 60, Appendix A, incorporated by reference in 35 Ill. Adm. Code 212.113, except that the length of the observing period shall be at the discretion of the observer, but not less than one minute. This Condition shall not apply to 35 Ill. Adm. Code 212.301, pursuant to 35 Ill. Adm. Code 212.107.
 - ii. Except as otherwise provided in 35 Ill. Adm. Code Part 212, and except for the methods of data reduction when applied to 35 Ill. Adm. Code 212.122 and 212.123, measurements of opacity shall be conducted in accordance with Method 9, 40 CFR Part 60, Appendix A, and the procedures in 40 CFR 60.675(c) and (d), if applicable, incorporated by reference in 35 Ill. Adm. Code 212.113, except that for roadways and parking areas the number of readings required for each vehicle pass will be three taken at 5-second intervals. The first reading shall be at the point of maximum opacity and second and third readings shall be made at the same

point, the observer standing at right angles to the plume at least 15 feet away from the plume and observing 4 feet above the surface of the roadway or parking area. After four vehicles have passed, the 12 readings will be averaged, pursuant to 35 Ill. Adm. Code 212.109.

- iii. Measurement of particulate matter emissions from stationary emission units subject to 35 Ill. Adm. Code Part 212 shall be conducted in accordance with 40 CFR part 60, Appendix A, Methods 5, 5A, 5D, or 5E, pursuant to 35 Ill. Adm. Code 212.110(a).
 - iv. The volumetric flow rate and gas velocity shall be determined in accordance with 40 CFR part 60, Appendix A, Methods 1, 1A, 2, 2A, 2C, 2D, 3, and 4, pursuant to 35 Ill. Adm. Code 212.110(b).
 - v. Upon a written notification by the Illinois EPA, the owner or operator of a particulate matter emission unit subject to 35 Ill. Adm. Code Part 212 shall conduct the applicable testing for particulate matter emissions, opacity, or visible emissions at such person's own expense, to demonstrate compliance. Such test results shall be submitted to the Illinois EPA within thirty (30) days after conducting the test unless an alternative time for submittal is agreed to by the Illinois EPA, pursuant to 35 Ill. Adm. Code 212.110(c).
- b. Testing required by Condition 8(a) shall be performed by a qualified independent testing service.
- 9a. Pursuant to 40 CFR 63.10(b)(3), if an owner or operator determines that his or her stationary source that emits (or has the potential to emit, without considering controls) one or more hazardous air pollutants regulated by any standard established pursuant to section 112(d) or (f) of the Clean Air Act, and that stationary source is in the source category regulated by the relevant standard, but that source is not subject to the relevant standard (or other requirement established under 40 CFR Part 63) because of limitations on the source's potential to emit or an exclusion, the owner or operator must keep a record of the applicability determination on site at the source for a period of 5 years after the determination, or until the source changes its operations to become an affected source, whichever comes first. The record of the applicability determination must be signed by the person making the determination and include an analysis (or other information) that demonstrates why the owner or operator believes the source is unaffected (e.g., because the source is an area source). The analysis (or other information) must be sufficiently detailed to allow the USEPA and/or Illinois EPA to make a finding about the source's applicability status with regard to the relevant standard or other requirement. If relevant, the analysis must be performed in accordance with requirements established in relevant subparts of 40 CFR Part 63 for this purpose for particular categories of stationary sources. If relevant, the analysis should be performed in accordance with USEPA guidance materials published to assist sources in making applicability

determinations under Section 112 of the Clean Air Act, if any. The requirements to determine applicability of a standard under 40 CFR 63.1(b)(3) and to record the results of that determination under 40 CFR 63.10(b)(3) shall not by themselves create an obligation for the owner or operator to obtain a Title V permit.

- b. Pursuant to 35 Ill. Adm. Code 212.110(e), the owner or operator of an emission unit subject to 35 Ill. Adm. Code Part 212 shall retain records of all tests which are performed. These records shall be retained for at least three (3) years after the date a test is performed.
- c. The Permittee shall maintain monthly records of the following items so as to demonstrate compliance with the conditions of this permit:
 - i. Amount of solvent processed in each batch (gallons/batch);
 - ii. Amount and type of oxide and silicone oil used per batch (lbs/batch);
 - iii. Number of batches processed in the pilot plant and oxide coating process (batches/month and batches/year); and
 - iv. Monthly and annual PM, VOM, and HAP emissions with supporting calculations (tons/months and tons/year).
10. All records and logs required by this permit shall be retained at a readily accessible location at the source for at least five (5) years from the date of entry and shall be made available for inspection and copying by the Illinois EPA or USEPA upon request. Any records retained in an electronic format (e.g., computer) shall be capable of being retrieved and printed on paper during normal source office hours so as to be able to respond to an Illinois EPA or USEPA request for records during the course of a source inspection.
11. If there is an exceedance of or deviation from the requirements of this permit as determined by the records required by this permit, the Permittee shall submit a report to the Illinois EPA's Compliance Section in Springfield, Illinois within 30 days after the exceedance/deviation. The report shall include the emissions released in accordance with the recordkeeping requirements, a copy of the relevant records, and a description of the exceedance or deviation and efforts to reduce emissions and future occurrences.
12. Pursuant to 35 Ill. Adm. Code 212.110(d), a person planning to conduct testing for particulate matter emissions to demonstrate compliance shall give written notice to the Illinois EPA of that intent. Such notification shall be given at least thirty (30) days prior to the initiation of the test unless a shorter period is agreed to by the Illinois EPA. Such notification shall state the specific test methods from 35 Ill. Adm. Code 212.110 that will be used.

13. Two (2) copies of required reports and notifications shall be sent to:

Illinois Environmental Protection Agency
Division of Air Pollution Control
Compliance Section (#40)
P.O. Box 19276
Springfield, Illinois 62794-9276

and one (1) copy shall be sent to the Illinois EPA's regional office at the following address unless otherwise indicated:

Illinois Environmental Protection Agency
Division of Air Pollution Control
9511 West Harrison
Des Plaines, Illinois 60016

If you have any questions on this permit, please contact George Kennedy at 217/782-2113.

Edwin C. Bakowski, P.E.
Acting Manager, Permit Section
Division of Air Pollution Control

ECB:GMK:psj

cc: IEPA, FOS Region 1
Lotus Notes

Attachment A - Emission Summary

This attachment provides a summary of the maximum emissions from the source operating in compliance with the requirements of this federally enforceable permit. In preparing this summary, the Illinois EPA used the annual operating scenario which results in maximum emissions from such a plant. The resulting maximum emissions are below the levels (e.g., 10 tons/year of any single HAP, 25 tons/year of total HAPs, and 100 tons/year of VOM) at which this source would be considered a major source for purposes of the Clean Air Act Permit Program. Actual emissions from this source will be less than predicted in this summary to the extent that less material is handled, and control measures are more effective than required in this permit.

<u>Material/Process</u>	E M I S S I O N S			
	PM (Tons/Year)	VOM (Tons/Year)	Single HAP (Methanol) (Tons/Year)	Combined HAPs (Tons/Year)
Pilot Plant/Solvent		15.21		
Pilot Plant/Dispersion	2.20			
Oxide Coating/Zinc Oxide	0.50			
Oxide Coating/Ethanol and Silicone Oil		1.50		
Oxide coating Process 2 Silicone Oil Containing Methanol		5.95	4.02	
Metal Oxide	2.99			
PVS Reactors	5.28			
Total	10.97	22.66	4.02	< 25

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