

State of California
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 08-18

February 28, 2008

Agenda Item No.: 8-2-2

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

WHEREAS, a research proposal, number 2652-259, entitled "Environmental Chamber Studies of Ozone Impacts of Coatings VOCs," has been submitted by the University of California, Riverside;

WHEREAS, the Research Division staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

Proposal Number 2652-259 entitled "Environmental Chamber Studies of Ozone Impacts of Coatings VOCs," submitted by the University of California, Riverside, for a total amount not to exceed \$200,041.

NOW, THEREFORE BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

Proposal Number 2652-259 entitled "Environmental Chamber Studies of Ozone Impacts of Coatings VOCs," submitted by the University of California, Riverside, for a total amount not to exceed \$200,041.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed \$200,041.

I hereby certify that the above is a true and correct copy of Resolution 08-18, as adopted by the Air Resources Board.



Lori Andreoni, Clerk of the Board

ATTACHMENT A**“Environmental Chamber Studies of Ozone Impacts of Coatings VOCs”****Background**

When coatings are applied, solvents are emitted that contain volatile organic compounds (VOC) that contribute to ozone formation. ARB staff is considering the feasibility of statewide regulation for architectural coatings. Industrial users of other VOC categories are allowed to determine the extent of allowable emissions based on the reactivity of the VOCs in their solvents. Data from experiments conducted in environmental chambers are necessary for the determination of reactivity values. These experiments determine, under controlled, simulated atmospheric conditions, the extent to which the VOCs produce oxidized break-down products that are important for ozone formation. However, past chamber work does not adequately characterize the production of VOC oxidation products. Therefore, a modified chamber is needed to adequately evaluate their ozone impact.

Objective

This project has two objectives. The first objective is to develop and test modifications to the University of California, Riverside's (UCR) environmental chamber in order to obtain better correlations with atmospheric reactivity. The other objective is to reduce uncertainties in reactivity estimates for coatings' VOCs of concern to ARB, for which mechanisms and reactivity estimates are either highly uncertain or nonexistent.

Methods

Both environmental chamber experiments and photochemical modeling analysis will be carried out to improve the estimates of ozone impacts of selected coatings' VOCs. The first task is to modify the UCR environmental chamber in order to obtain better correlations with atmospheric reactivity. This will occur after a modeling analysis is conducted that is designed to determine the effects of various experimental approaches. UCR will then apply the improved reactivity experiment approach to VOCs that are important in architectural coatings. ARB staff will advise UCR on the specific compounds to be studied. Results from experiments will be integrated into the updated atmospheric mechanism (SAPRC-07), which will then be used in photochemical modeling to estimate the ozone impacts.

Expected Results

For several VOCs used in architectural coatings, UCR will estimate their reactivities using current chemical mechanisms. UCR will then conduct chamber experiments to test the mechanisms by conducting model simulations of the experiments, to determine if the mechanisms can correctly predict the effects of the compounds on reactivity. Results from experiments using the new methods on representative VOCs found in architectural coatings will be used to assess the reliability of the mechanisms. Using the experimentally evaluated mechanisms, the final report will include improved estimates of ozone reactivity for the studied VOCs.

Significance to the Board

Emissions from architectural coatings are an important component of the stationary source VOC inventory. ARB is investigating a reactivity-based control strategy because it could lead to more cost-effective and flexible regulations. Several factors need to be considered in deciding whether reactivity is an appropriate control strategy for architectural coatings. One factor is the confidence staff have in estimating the ozone formation potential of VOC emissions from architectural coatings. For this project, VOCs used in architectural coatings will be tested to obtain more reliable estimates of their ozone impacts. Successful completion of this project would improve the ARB's ability to quantify ozone impacts associated with architectural coatings. ARB would then be able to develop regulations that should lead to less ozone exposure, with the lowest possible expense by the affected industry.

Contractor:

University of California, Riverside

Contract Period:

24 months

Principal Investigator (PI):

Dr. William P.L. Carter

Contract Amount:

\$200,041

Cofunding:

None. However, this project would serve as a component of the "Paints and Architectural Coatings Environmental Study" (PACES) that recently started at UCR. "PACES" includes several coordinated studies, with funding from the coatings industry and regulatory agencies. Also, the environmental chamber facility that will be used in this project was built recently with funding from the United States Environmental Protection Agency. Considering the significant amount of federal funding used to build this state-of-the-art chamber, this project is very cost-effective. Only about 20 percent of the overall project budget will be used to upgrade the chamber.

Basis for Indirect Cost Rate:

The State and the UC system have agreed to a ten percent indirect cost rate.

Past Experience with this Principal Investigator:

Under contract to ARB, this PI recently developed SAPRC-07, an update to his SAPRC-99 chemical mechanism, which has been widely used in different applications throughout the world. He compiled the list of VOC reactivity codified in California's Aerosol Coating Products and Low Emission Vehicle/Clean Fuels regulations. He has completed several studies on VOC reactivity for the ARB, and has always delivered a high-quality product at a very reasonable cost.

Prior Research Division Funding to the University of California, Riverside:

Year	2007	2006	2005
Funding	\$94,869	\$344,372	\$684,627

BUDGET SUMMARY

Contractor: University of California, Riverside

Environmental Chamber Studies of Ozone Impacts of Coatings VOCs

DIRECT COSTS AND BENEFITS

1.	Labor and Employee Fringe Benefits	\$	99,016
2.	Subcontractors	\$	0
3.	Equipment	\$	32,779 ¹
4.	Travel and Subsistence	\$	0
5.	Electronic Data Processing	\$	0
6.	Reproduction/Publication	\$	0
7.	Mail and Phone	\$	0
8.	Supplies	\$	23,776 ²
9.	Analyses	\$	0
10.	Miscellaneous	\$	<u>32,191³</u>
	Total Direct Costs		\$187,762

INDIRECT COSTS

1.	Overhead	\$	12,279
2.	General and Administrative Expenses	\$	0
3.	Other Indirect Costs	\$	0
4.	Fee or Profit	\$	<u>0</u>
	Total Indirect Costs		<u>\$12,279</u>

TOTAL PROJECT COSTS**\$200,041**

¹ Equipment: \$20,000, fabrication of banks of blacklights
\$ 5,000, flow controller system for multi-day dilution experiments
\$ 7,779, upgrade air compressor
\$32,779

² Supplies: \$ 8,565, research lab supplies
\$ 6,852, lamp supplies
\$ 4,933, general analyzer repairs and supplies
\$ 3,426, FEP Teflon for replacement reactors
\$23,776

³ Miscel.: \$ 2,721, graduate student fees
\$29,470, facility rental fee
\$32,191