

State of California  
AIR RESOURCES BOARD

Resolution 01-54

November 15, 2001

Agenda Item No.: 01-9-4

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 2503-222, entitled "Improved Reactivity Estimates for Volatile Organic Compounds Used in Architectural Coatings," has been submitted by the University of California, Riverside;

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

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

Proposal Number 2503-222 entitled "Improved Reactivity Estimates for Volatile Organic Compounds Used in Architectural Coatings," submitted by the University of California, Riverside, for a total amount not to exceed \$240,102.

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 2503-222 entitled "Improved Reactivity Estimates for Volatile Organic Compounds Used in Architectural Coatings," submitted by the University of California, Riverside, for a total amount not to exceed \$240,102.

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 \$240,102.

I hereby certify that the above is a true and correct copy of Resolution 01-54, as adopted by the Air Resources Board.

---

Marie Kavan, Clerk of the Board

## ATTACHMENT A

### “Improved Reactivity Estimates for Volatile Organic Compounds Used in Architectural Coatings”

#### Background

Emissions from architectural coatings are an important component of the stationary source volatile organic compounds (VOC) inventory. The ARB approved the implementation of additional controls for VOC emissions in architectural coatings in June 2000. The ARB is investigating a reactivity-based control strategy because it can potentially make control strategies more cost-effective and flexible. There are a number of factors that need to be considered in the decision as to whether reactivity is an appropriate control strategy for architectural coatings. One of the factors is the level of confidence in estimating the ozone formation potential of VOC emissions from architectural coatings. This project will improve the ARB’s ability to quantify ozone impacts associated with architectural coatings.

Earlier this year, the ARB approved the research proposal entitled “Evaluation of Atmospheric Impacts of Selected Coatings VOC Emissions,” submitted by Dr. William Carter at the University of California, Riverside. Due to the limited funding allocated at that time, only three tasks were selected for this project after discussion with ARB staff and the Reactivity Research Advisory Committee (RRAC), a group of representatives from the solvent and coatings industries and the California Air Districts.

This proposal is an extension of the existing project and will complete the remaining tasks. Additional compounds and petroleum distillates will be selected after discussion with ARB staff and the RRAC.

#### Objective

The overall objective of both the existing project and this proposal is to reduce uncertainties in ozone reactivity estimates for selected VOCs in architectural coatings. The specific objective of this proposal is to conduct additional environmental chamber and direct reactivity screening measurement research. This information is needed to reduce the uncertainties associated with quantifying the ozone formation potential of VOCs in architectural coatings.

#### Methods

Two methods proposed in this project are (1) environmental chamber studies of selected coatings VOCs, and (2) application of direct reactivity measurement methods to coatings constituents. Environmental chamber experiments are needed to fully evaluate all aspects of the mechanism that may affect reactivity under atmospheric conditions. This is an important component when assessing the reactivity estimates of coatings VOCs with respect to ozone formation. Direct reactivity measurement of a VOC can provide not only useful data for the evaluation of VOC reaction rate in the atmosphere but also the amount of ozone formation attributed to its reactions. It can potentially be carried out easily and inexpensively than chamber studies.

**Expected Results**

The product from this effort will be reactivity estimates for selected VOCs associated with architectural coatings.

**Significance to the Board**

The results of this project will provide necessary information regarding the feasibility of a reactivity-based control strategy for architectural coatings.

**Contractor:**  
University of California, Riverside

**Contract Period:**  
36 months

**Principal Investigator (PI):**  
William P. L. Carter, Ph.D.

**Contract Amount:**  
\$240,102

**Cofunding:**

The U. S. Environmental Protection Agency (USEPA) is funding a four-year project (\$2.9 million) to develop the next-generation environmental chamber facility needed for evaluating gas-phase and gas-to-particle atmospheric reaction mechanisms. The ARB project will use the USPEA-funded facility to conduct chamber experiments for selected VOCs in architectural coatings.

**Basis for Indirect Cost Rate:**

The indirect cost rate of 10 percent is a negotiated rate agreed to by the State and University of California campuses.

**Past Experience with this Principal Investigator:**

The principal investigator, Dr. William Carter, is one of the pioneers in determining and quantifying VOC reactivity. He is the leader of the VOC reactivity assessment team for NARSTO, an organization that represents all North American groups involved in air pollution research. He has published approximately 75 journal articles and almost 70 technical reports in the areas of atmospheric chemistry, chemical mechanism development, and VOC reactivity assessment. He compiled the list of compound reactivities codified in California’s Low-emissions Vehicles/Clean Fuels and aerosol coatings regulations. He has completed several studies on VOC reactivity for the ARB and has always delivered a quality product at a reasonable cost.

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

Year	2001	2000	1999
Funding	\$79,884	\$654,788	\$484,943

# BUDGET SUMMARY

University of California, Riverside

Improved Reactivity Estimates for Volatile Organic Compounds Used in Architectural Coatings

## **DIRECT COSTS AND BENEFITS**

1.	Labor and Employee Fringe Benefits	\$ 84,104 <sup>1</sup>	
2.	Subcontractors	\$ 0	
3.	Equipment	\$ 0	
4.	Travel and Subsistence	\$ 750	
5.	Electronic Data Processing	\$ 0	
6.	Reproduction/Publication	\$ 0	
7.	Mail and Phone	\$ 100	
8.	Supplies	\$ 17,150 <sup>2</sup>	
9.	Analyses	\$ 88,406 <sup>3</sup>	
10.	Miscellaneous	\$ 30,542 <sup>4</sup>	
	Total Direct Costs		\$221,052

## **INDIRECT COSTS**

1.	Overhead	\$19,050	
2.	General and Administrative Expenses	\$ 0	
3.	Other Indirect Costs	\$ 0	
4.	Fee or Profit	\$ 0	
	Total Indirect Costs		\$19,050

## **TOTAL PROJECT COSTS**

**\$240,102**

---

<sup>1</sup> \$22,088 for the PI, \$36,125 for staff, and \$25,890 for students (postdoctoral, graduate, and undergraduate)

<sup>2</sup> \$10,500 for chamber light power and \$6,650 misc. laboratory supplies such as chemicals and compressed gases

<sup>3</sup> Usage fees of chamber laboratory: 135.8 days @ \$651/day

<sup>4</sup> Office rental fees at CE-CERT: 15.29 months @ \$2,000/month