

Altshuller A P & Bufalini J J. Photochemical aspects of air pollution: a review.
Environ. Sci. Technol. 5:39-64, 1971.
[Division of Chemistry and Physics, National Air Pollution Control Administration,
US Department of Health, Education, and Welfare, Cincinnati, OH]

This paper critically reviewed the literature on photochemical air pollution. It covered various aspects of air pollution, including ozone formation, peroxybenzoyl formation, and hydrogen peroxide. The paper also discussed the concept of reactivity and singlet oxygen importance to air pollution. [The *SCI*[®] indicates that this paper has been cited over 120 times, one of the 10 most-cited papers for this journal.]

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The review published in *Environmental Science & Technology (ES&T)* was the result of a request from the editor of that journal. We had previously published an earlier version of the paper in another journal.¹ Since *ES&T* was a new American Chemical Society publication, the editor suggested that a new review on air pollution would greatly assist the readers of the journal. The paper took longer to write than we had anticipated since the number of publications in this field was mushrooming. For this reason, we had to limit the coverage to only gas-phase chemistry. Aerosol formation and plant-damage studies were not included even though they were covered in the earlier review.¹ Even with their exclusion, the paper was much longer than the editor expected or desired. At that time, *ES&T* could only allow

25-30 pages for scientific papers. He nonetheless graciously published our review.

Our most severe disappointment with the paper was that it came too early and thus omitted photochemical modeling. Modeling at this time was in its infancy and we couldn't discuss this field. The review would have taken a significantly different viewpoint if we had, since many aspects could have been discussed more intelligently had we had a mathematical model to test the various scenarios. This is particularly true in ascertaining the role of OH radicals in the reaction scheme as well as elucidating the problems dealing with dirty chamber effects.

Although we have made considerable progress in understanding photochemical air pollution, it is interesting to note that some of the same problems remain. We still do not have a good carbon balance on hydrocarbons when photooxidized. This is especially true for the aromatics. The role of natural hydrocarbons in the formation of photochemical air pollution is still in a sorry state. We know that these hydrocarbons (terpenes and hemiterpene) participate in the production of ozone, but their concentrations do not agree with the emission inventories.² We calculate the natural hydrocarbon emissions to be much greater than the man-made emissions, but the concentrations measured in the ambient air are always much lower. There is still a problem with the oxidation of SO₂. Some investigators suggest homogeneous oxidation via OH radical reactions, while others suggest heterogeneous oxidation on particulate surfaces.

This review is probably cited because it presented most of the important literature in a concise and critical manner. It was also important because it presented future avenues of research. It was a critical review in that it appraised earlier work. We would like to think that it stimulated young scientists to work in this field.

1 Altshuller A P & Bufalini J J. Photochemical aspects of air pollution: a review
Photochem Photobiol 4:97-146, 1965 (Cited 90 times)

2 Altshuller A P. Review: natural volatile organic substances and their effect on air quality in the United States
Atmos Environ 17:2131-65, 1983