

ENVIRONMENTAL QUALITY

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ABSTRACTS

Ambient Air Ozone Concentrations in Central Indiana. WILLIAM BERANEK, JR., Environmental Research Service, Indianapolis Center for Advanced Research, Indianapolis, Indiana 46202. — Marion County has been declared a nonattainment area for ozone air concentrations by the United States Environmental Protection Agency. Control measures have been instituted to reduce hydrocarbon emissions in Marion County in order to reduce the number of ozone excursions. Since ozone is created by sunlight from chemical precursors, it is important that the relative contribution of sources of all precursors be understood in order to prepare an effective control policy. Data on time, location and intensity of ozone air concentrations in central Indiana indicates that a major contribution to ozone concentrations on some critical days occurs from precursors external to the area. This evidence is presented and discussed in the context of pollution control policy.

Potential Effects of Acid Rain on the Mortality and Development of *Aedes triseriatus* Larvae and Pupae. KEITH R. FADELY and HORST F. SIEWART, Department of Natural Resources, Ball State University, Muncie, Indiana, 47306. — Larvae of *Ae. triseriatus* mosquitoes were collected from treeholes on the Ball State University campus. These insects were raised to adulthood under laboratory conditions. Newly hatched larvae were raised in deionized water. One hundred twenty-five instar 1 mosquitoes (group A) were placed into separate baby food jars containing deionized water. These jars were separated into five groups. The pH of the water in each group was 3, 4, 5, 6 and 7. Subsequent groups composed of 125 instar 2, 3 and 4 larvae and pupae (groups B, C, D and E respectively) were exposed to the same experimental treatment as that of group A. The effects of each of these pH levels on mortality and development was observed until the insects reached maturity or died.

Larvae in water of pH 3 experienced higher percentage of mortality than mosquitoes exposed to more basic solutions. Larvae experienced a decrease in mortality with age. Instar 4 experienced the lowest mortality. Mortality of immature *Ae. triseriatus* in groups A and B was highest during their development as instar 2 larvae. The lowest mortality occurred at instar 4 among groups A, B, C and D. The duration of developmental time among larvae in pH 3, 4, 5, 6 and 7 decreased as the hydrogen ion concentration decreased. Mosquitoes in solutions of pH 3 required the greatest amount of developmental time. At pH 7, the shortest time was required. Developmental time increased with larval age as acidity increased. Instar 1 larvae required less time than any other developmental stage. The longest amount of time was required by instar 4.

A Revision of the Traditional K_2 —Temperament Relationship of Stream Reaeration. ROBERT H. L. HOWE and JOHN M. HAWKINS, Institute of Advanced Environmen-

tal Health Science Research, Joint Project, West Lafayette, Indiana 47906. — The oxygenation coefficient of streams (K_2) is temperature dependent and the following equation has been used for decades to calculate the K_2 value at higher temperature levels by its known value at 20°C:

$$K_2(T) = K_2(20) \times \theta^{T-20} \quad \text{--- Eq.(1)}$$

where: $K_2(T)$ = oxygenation coefficient at T°C.

$K_2(20)$ = oxygenation coefficient at 20°C.

θ = temperature coefficient

The value of θ is greater than 1.0 (1.01 - 1.05) thus equation (1) delineates an increasing K_2 value at higher temperature.

Recently, Howe (1977) proposed that the K_2 value decreases as the liquid temperature increases. Based on his laboratory data, the following modification of the K_2 —temperature relationship was proposed:

$$K_2(T) = K_2(20)/\theta^{T-20} \quad \text{--- Eq.(2)}$$

and $\theta = 1.125$

our recent results have shown that the K_2 —temperature relationship is dependent on the magnitude of K_2 . When the K_2 value is below 40 day⁻¹, it decreases at increasing liquid temperatures while other factors remain constant. Howe's modified equation seems to be valid for oxygenation conditions of relatively low air flow rates or power input for aeration.

The Air Discharge per Manufacturing Employee in Indiana. STUART L. IRWIN AND WILLIAM BERANEK, JR., Environmental Research Service, Indianapolis Center for Advanced Research, Indianapolis, Indiana 46202. — Several locations in Indiana have ambient air concentrations of sulfur dioxide and particulate which exceed the primary standard established by the United States Environmental Protection Agency. Combustion of coal and oil by manufacturers in Indiana is responsible for most of the point source discharge of sulfur dioxide and particulates. Since the U.S. EPA requires economic development to be accomplished without deterioration of air quality, Indiana policymakers must be able to predict the impact of air pollutant discharges from the anticipated increase in manufacturing activity.

To predict future air pollution in communities in Indiana, it is necessary to estimate the growth in the manufacturing sector by industry type and by facility size. Different industry types have different discharge characteristics. Different facility sizes have different control requirements and different impacts on air quality. We have calculated a general ratio of pollution per employee for Indiana for the industry-types projected to expand in Indiana. We have compared the calculated emission increase with actual emissions by industry in Indianapolis. This ratio can be used by air quality planners along with economic projections to estimate changes in overall air quality.

Simulated Chemical Weathering of Coal and Overburden Materials. PATRICK J. SULLIVAN, Department of Natural Resources, Ball State University, Muncie, Indiana 47306. — One Pennsylvanian coal, one Pennsylvanian gray shale and a Cretaceous red sand from the Kellerman mine in Tuscaloosa, Alabama were leached in Soxhlet extractors at 25°C for 144 hours. Identical samples were leached once a week for 11 weeks using a humidity cell at approximately 25°C. Leachate collected

from the soxhlet and humidity cell apparatus was analyzed for pH, EC, SO_4 , Fe, Mn and total acidity.

The data indicate that concentrations of SO_4 , Fe, and Mn in the leachate (both the soxhlet and humidity cell) are greater from the coal and the shale greater than the red sand. This is primarily the result of pyrite and soluble phases in the coal. A comparison of the leachate characteristics of the soxhlet and humidity cell showed that the soxhlet removed 50% more total Fe, Mn, and SO_4 for the complete leaching cycle. Thus, the origin of leachate acidity and weathering products in the humidity cell could not be distinguished between the soluble mineral phases and weathering reactions.

The results of this experiment suggest that the use of the soxhlet extractor for leaching coal materials may produce a faster and more accurate representation of the order of chemical weathering than humidity cell.