

NONBIOLOGIC EFFECTS OF LEAD

B. On Glass (Viechnicki)

Concentrations of airborne lead in the air over cities can reach $4\mu\text{g}/\text{m}^3$ of air or 4 parts per billion (ppb).¹ This is about the same concentration of lead in sea water, i.e., 4-5 ppb.² The average concentration of lead in the earth's crust is 1.6×10^4 ppb.³ Thus in the minerals used in the manufacture of glass the concentration of lead will be at least 10^3 or 10^4 times as high as that found in the atmosphere. In fact, impurities in starting materials used in ceramics research are given in terms of parts per million (ppm) and starting materials used in manufacturing of ceramics are not controlled as closely as those used in research. Lead is used in the manufacture of glass at much higher concentrations. Decorative and optical glass commonly and incorrectly called "crystal" contains high concentrations of lead, up to 58 weight %, ⁴ because of the good optical properties that result in the glass. It may be concluded that glass contains lead at higher concentrations than normally found in the atmosphere, and the small concentration of lead normally found in the atmosphere will have no detrimental effects on the glass.

Two practical examples of the lack of reaction between lead and glass will be cited. First, glass is not adversely affected by sea water which has a lead concentration of 4-5 ppb; the U.S. Navy is interested in glass as a material for deep submersible vehicles. The second example is that leaded gasoline can be stored in glass with no degradation of the glass. In older cars there was at one time a filter in the fuel line enclosed in a glass bulb which did not degrade.

Lead will react with glass at elevated temperatures, $>400^{\circ}\text{C}$.⁵ It is a problem above these temperatures and at higher concentrations, for example, the hot exhaust from an internal combustion engine impinges upon a glass, and has prevented the use of glass in such items as manifolds.⁶⁻⁸ Although reactions occur at high temperatures and at high concentrations, at low temperatures (25°C) and concentrations, airborne lead has no effect on glass.

References

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