

# EFFICACY OF QUENCHED ETHYLENE OXIDE AS A STERILANT FOR WOOD AT ROOM TEMPERATURE

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(Received 20 July 1981)

## ABSTRACT

Small wood blocks infested with bacteria and fungi were adjusted to moisture contents of 0, 8 and 53% and exposed to ethylene oxide containing 88% dichlorodifluoromethane for up to 32 h at room temperature. This procedure is not a practical method for sterilizing wood.

**Keywords:** Ethylene oxide, bacteria-infestation, fungi, sterilization.

Sterilization of wood is normally done using moist or dry heat, gamma radiation, or gaseous sterilization with propylene or ethylene oxide. All of these methods have drawbacks; heat may remove wood extractives or chemicals added to the wood, and while gamma radiation is effective (Sharman and Smith 1970) and does not adversely affect subsequent attack by some fungi (Smith and Sharman 1971), equipment availability may prevent its use. Propylene oxide, while effective (Smith 1965), is a slower acting sterilant than ethylene oxide and is more difficult to remove from the wood (Phillips 1949; Kaye 1949; Smith 1965). Residual propylene oxide in wood may affect subsequent fungal growth (Smith 1965). Sterilization with propylene or ethylene oxide is also known to increase the toxicity of creosote-treated wood to *Lentinus lepideus* (DaCosta and Osborne 1969; Smith and Sharman 1971).

These characteristics make ethylene oxide the preferred sterilant for wood. Of concern to workers, however, is the explosive nature of ethylene oxide and air mixtures; from 3% to 80% ethylene oxide vapor in air can be violently explosive (Phillips and Kaye 1949). By quenching ethylene oxide with carbon dioxide or fluorinated hydrocarbons, it is possible to obtain an effective, nonexplosive mixture (Lawrence and Block 1968).

Because Smith (1965) indicated a 24-h-exposure wood sterilization requirement for 70% ethylene oxide, we decided to investigate whether ethylene oxide quenched with an inert gas to a concentration of about 12% was a practical disinfectant for wood. As many workers (Kaye and Phillips 1949; Opfell et al. 1959; Gilbert et al. 1964; Smith 1968) have reported a requirement for moisture during the sterilization process, its efficacy was examined at three different wood moisture contents.

The activity of ethylene oxide roughly doubles with each 10 C rise in temperature (Lawrence and Block 1968), a fact utilized in commercial sterilization operations. As elevated temperatures are often impractical in laboratory-scale testing or may be detrimental where chemical wood preservatives are being evaluated in a wood substrate, we decided to evaluate the sterilization efficacy only at room temperature.