Dehydrating and Sterilizing Wastes Using Supercritical CO$_2$

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A relatively low-temperature process for dehydrating and sterilizing biohazardous wastes in an enclosed life-support system exploits (1) the superior mass-transport properties of supercritical fluids in general and (2) the demonstrated sterilizing property of supercritical CO$_2$ in particular. The wastes to be treated are placed in a chamber. Liquid CO$_2$, drawn from storage at a pressure of 850 psi (≈5.9 MPa) and temperature of 0 °C, is compressed to pressure of 2 kpsi (≈14 MPa) and made to flow into the chamber. The compression raises the temperature to 10 °C. The chamber and its contents are then further heated to 40 °C, putting the CO$_2$ into a supercritical state, in which it kills microorganisms in the chamber. Carrying dissolved water, the CO$_2$ leaves the chamber through a back-pressure regulator, through which it is expanded back to the storage pressure. The expanded CO$_2$ is refrigerated to extract the dissolved water as ice, and is then returned to the storage tank at 0 °C.

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