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SHERD WATER UPTAKE MEASUREMENTS

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The effect of water uptake on the sherd dose rate has been known for some time (Zimmerman 1970) and dose rate corrections have been introduced (Zimmerman 1971). These corrections use the measured value of the maximum water uptake and assumed values for the fraction of total uptake, related to burial and climatic conditions at the site. The purpose of this short note is to introduce results of water uptake experiments so that an accurate measure of maximum water uptake may be made.

The questions asked were: a) what is an efficient method in which to introduce the water for maximum saturation and b) how long must the sherd be in the water for an effective measurement to be made? Measurements were performed on a total of eleven sherds covering a wide range of total water uptake values (5 to 35% water by weight). The sherds were wet using three techniques: a) simply plunging the dry sherd into a beaker of distilled water, b) placing the sherd in a dry beaker (in a vertical position) and slowly (over 24 hours) dripping distilled water into the beaker until the sherd was covered, c) placing the sherd in water and bringing the water to a boil, then allowing the water and sherd to cool to room temperature. In all cases, before wetting, the sherds were dried for 24 hours at 70°C. They were then weighed to determine their dry weight (sherds stored under normal room conditions can easily contain water up to a few percent of their dry weight). Subsequent wet measurements were made by removing the sherd from water, blotting dry with a tissue and weighing. The fractional water uptake is simply the wet weight minus the dry weight divided by the dry weight.

Figure 1 shows representative results from two sherds, illustrating the fractional water uptake as a function of time after the sherds were covered with water. Note that dripping has a greater wetting effect than simply plunging (in most cases, 5% to 15% increase in the total water uptake). Boiling the sherds was less effective than plunging or dripping. For the eleven sherds tested, the increase in water uptake measured after four days wetting compared to only one day wetting is relatively large (7.5% to 15% of total uptake). However, the increase from the third to fourth day is relatively small (from 2% to 5% of the total).

The results of these tests suggest a technique to be used to most accurately measure the total water uptake in ceramic sherds in a reasonable amount of time. The material should be wet slowly (over 24 hours) by dripping water, the sherd in a vertical position and a broken or unglazed edge at top and bottom. This ensures that the water is most effectively drawn into the pores by capillary action. Reasonable results should be expected at the end of three to four days wetting time.

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References

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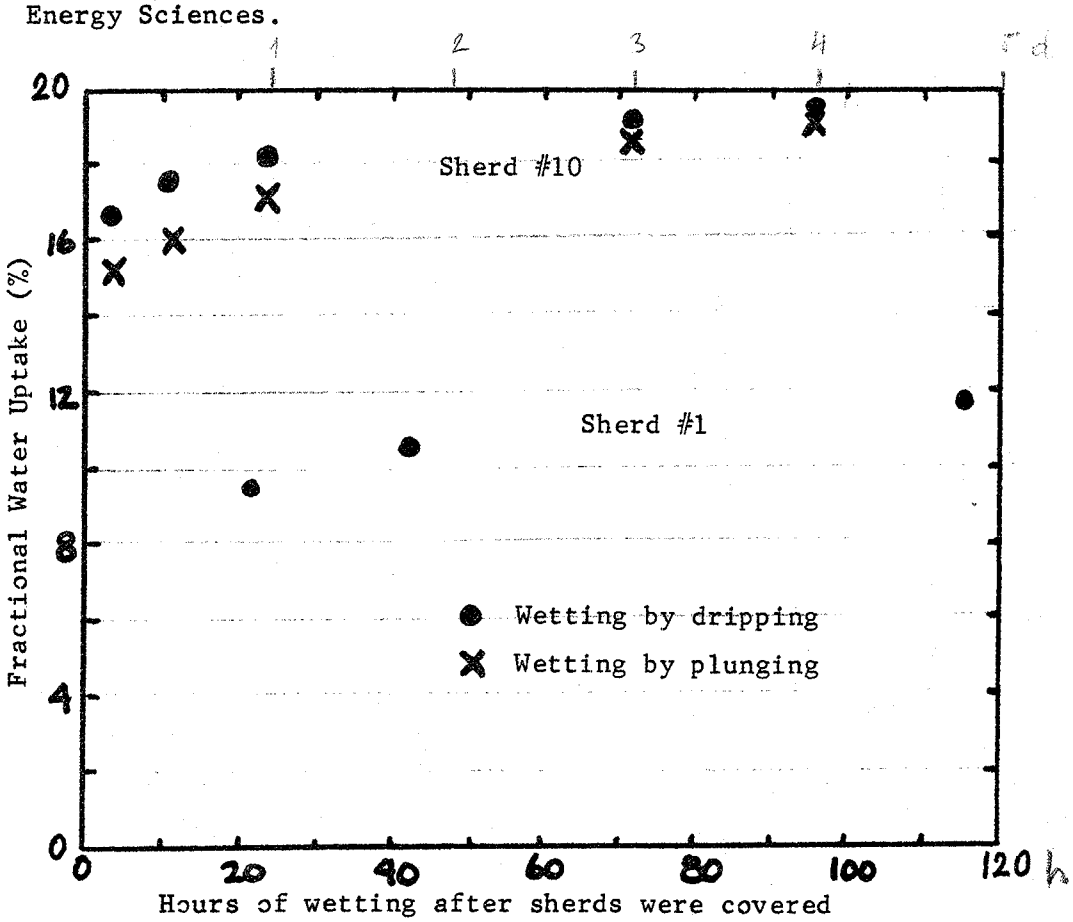

Figure 1.