

Recycling Osmium Tetroxide

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Osmium tetroxide is indeed wonderful stuff. Osmium is a rare element, so disposal of used solutions should consist of recycling, not dumping, even though osmium compounds are not considered environmentally hazardous (Smith *et al.*, 1978 *Trace Metal in the Environment*, vol 4. Ann Arbor Science Publishers). The colorless and soluble toxic tetroxide is rapidly reduced by almost any kind of dirt to a black, insoluble dioxide, usually in a colloidal form that's readily dispersed by moving water if it isn't firmly stuck to the solid organic matter that brought about the reduction.

If OsO_4 slops are collected in alcohol, the osmium (now in the form of crude, harmless, insoluble osmium dioxide) can be reoxidized, purified, re-reduced to pure OsO_2 and stored. OsO_2 is easily re-oxidized to give a buffered solution of osmium tetroxide (2% or less). See J. Microsc. 113:77-82 (1978); the procedure does involve certain hazards, so it must be done carefully.

Recovered OsO_4 can also be used to make osmeth, which is a beautiful golden crystalline solid that contains osmium tetroxide complexed with methenamine (= hexamethylene tetramine or hexamine (Hanker *et al.*, 1976 *Histochemistry* 49:263-291). It costs next to nothing to make your own osmeth from recycled OsO_4 , but osmeth is very expensive to buy. Osmeth does not emit osmic fumes. When it is dissolved (in DMF followed by dilution in an aqueous buffer) it becomes a dilute (0.25%) working osmium tetroxide solution. I can vouch for the

excellence of home-made osmeth for post-osmication (for EM). It may also be OK as a primary fixative or for LM staining, but I haven't encountered (personally, by anecdote or in the literature) any use of osmeth other than for postosmication. Perhaps someone reading this note will put me right on this.

Osmium tetroxide collected into vegetable oil could not be recycled by the simple method cited above, and the recovery methods used by chemists (which use apparatus *etc.* not found in histology labs) would be made more difficult by the presence of the oil. ■

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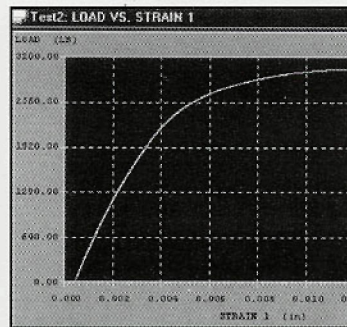
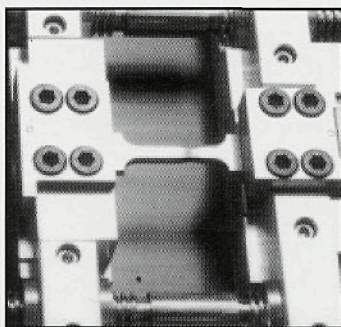



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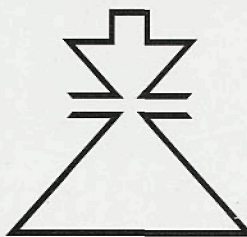
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