

Ruthenium Tetroxide

0.5% Aqueous Solution

Background and Properties:

In its crystal form, ruthenium (VIII) oxide (RuO_4), m.w. 165.7, is a golden yellow, volatile solid which sublimates at room temperature. It has mp of 25.4°C and bp of 40°C. It is sparingly soluble in water (2% w/v at 20°C), but freely soluble in carbon tetrachloride. Solvents such as ether, alcohol, benzene and pyridine react violently with RuO_4 . Ruthenium tetroxide is not only less volatile and less toxic¹ than osmium tetroxide but it is also a stronger oxidizing agent.^{1,3} It reacts with many organic compounds like olefins, sulfides, primary and secondary alcohols, and aldehydes. It also degrades benzene rings.³

Applications and Instructions:

Ruthenium tetroxide is closely related to osmium tetroxide and is useful as a staining agent for Electron Microscopy of polymers and their blends, and as a fixative for biological samples.^{4,6} It fixes the membranes in rat kidneys, liver, and ventral lobe of prostate, and these membranes appeared thicker than those preserved with other fixatives.⁷ Ruthenium tetroxide shows excellent staining of saturated and unsaturated polymer materials with improved image contrast. RuO_4 staining also has a stabilizing effect against electron beam damage of material films. Ruthenium tetroxide penetrates tissue very slowly, reacting strongly with proteins, glycogen, and monosaccharides.^{7,8}

A typical procedure consists of prefixing with buffered 4% glutaraldehyde followed by postfixation with buffered ruthenium tetroxide 0.1 - .05% at pH = 7.1 for 1 hour at 4°C.⁵ Specimens should be rinsed in water before dehydrating with alcohol or acetone.

NOTE: Ruthenium tetroxide, 0.5% aqueous, is a light golden brown solution. Solutions will turn black with exposure to organic material or strong U.V. light.

Handling Precautions:

Ruthenium tetroxide is a strong oxidizing agent and must be stored, refrigerated, protected from light. It reacts violently with filter paper and alcohol. Do not place ruthenium tetroxide solutions into waste containers containing alcohol, ether, benzene, pyridine, or other organic compounds.

Ruthenium tetroxide has an acrid odor. Vapors are irritating to eyes and respiratory tract. Wear protective goggles and gloves. Handle only in a hood. In case of spillage, flush with sodium bisulfite solution to decompose RuO_4 and then flush with plenty of water.

Ordering Information:

Cat. #	Description	Size
18253	Ruthenium tetroxide,	5 x 10ml
	0.5% stabilized aqueous solution	10 x 10 ml
		25 x 10 ml

* supplied in ampoules

To Order:

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References:

1. Berkowitz, L.M. and Rylander, P.N., J. Am. Chem. Soc., **80**, 6682 (1958).
2. Djerassi, C. and Engle, R.R., J. Am. Chem. Soc., **75**, 3838 (1953).
3. Wolfe, S., Hasan, S.K., and Campbell, J.R., Chem. Comm., 1420 (1970).
4. Trent, J.S., Macromolecules, **17**, 2930 (1984); **16**, 539 (1983).
5. Peltarri, A., Histochem. J., **11**, 599 (1979).
6. Caughey, R.C. and Miller, M.A., Proceed. of 44th Ann. Mtg. EMSA (1986), p. 256.
7. Hayat, M.A., Fixation for Electron Microscopy, Academic Press, NY, 1981, p. 194.
8. Gaylarde, P., Science, **161**, 1157 (1968).