

Product Information

TRITON X-100

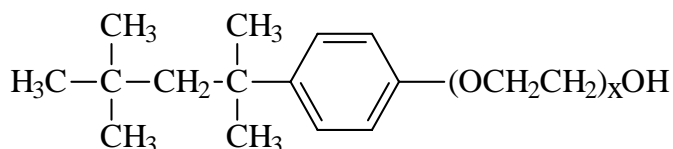
Product Number **X-100, T9284, T8787, T8532**

Storage Temperature 25°C

CAS #: 9002-93-1

Synonyms: X-100; TRITON X-100¹; Octylphenol ethylene oxide condensate¹

Product Description



$$x = 9-10$$

Appearance: Liquid, clear to slightly hazy, colorless to light yellow

Specific gravity: 1.065 at 25°C (approx. 1.07 g/mL)¹

Approximate Molecular Weight: 625¹;
 effective molarity = 1.7 M for the neat liquid.¹

UV absorption: λ_{\max} = 275 nm ($E^{1\%} = 23.9$) and 283 nm ($E^{1\%} = 19.4$) in methanol²

Typical values:

Viscosity (Brookfield): 240 cps at 25°C¹

Cloud point (1% aqueous solution): 63-69°C¹

Pour point: 7°C¹

pH (5% aqueous solution): 6.0 to 8.0¹

Calculated HLB value: 13.5¹

Critical micelle concentration (CMC): 0.22 to 0.24 mM^{3,4}

The structure of Triton X-100 is very similar to that of Igepal CA-630 (Sigma I3021) and of Nonidet P-40 (no longer commercially available); the names are sometimes reported as synonyms.⁵ However, Triton X-100 is slightly more hydrophilic than Igepal CA-630. The two are not considered to be functionally interchangeable in most applications.

Triton X-100 is a nonionic detergent, 100% active ingredient, which is often used in biochemical applications to solubilize proteins. Triton X-100 has no antimicrobial properties.¹ It is considered a comparatively mild non-denaturing detergent and is

reported in numerous references. It does absorb in the ultraviolet region of the spectrum, so it can interfere with protein quantitation by absorption at $A_{280\text{nm}}$. A number of polymeric resins have been used to remove X-100 from solution, including Amberlite hydrophobic XAD resins⁶ and Rezorian A161 cartridges.³

The "Triton X" series of detergents are produced from octylphenol polymerized with ethylene oxide. The number ("-100") relates only indirectly to the number of ethylene oxide units in the structure. X-100 has an "average of 9.5" ethylene oxide units per molecule, with an average molecular weight of 625.^{1,3} In addition, lower and higher mole adducts will be present in lesser amounts, varying slightly within supplier's standard manufacturing conditions. A by-product formed during the reaction is polyethylene glycol, a homopolymer of ethylene oxide. Acid is also added to the product to neutralize the product after the base catalyzed reaction is completed. No antioxidants are added by Sigma or the manufacturer, but commercial preparations of Triton X-100 have been found to contain peroxides up to 0.22% hydrogen peroxide (H_2O_2) equivalents,⁷ which may interfere with biological reactions. Sigma offers X-100-PC and X-100R-PC as alternatives. Triton X-100 absorbs in the UV spectrum at approximately the same wavelength as proteins (280 nm). Sigma offers two "reduced", i.e., hydrogenated forms, X-100-RS and X-100R-PC that have significantly lower absorbance in this region.⁴

For lysing cells, typically about 0.1% X-100 solution in water will be sufficient, and even up to 0.5% concentrations will usually not harm most enzymes being isolated.³ Many enzymes remain active in the presence of X-100; for example, Proteinase K, remains active in 1% (w/w) solutions of X-100.⁸

Triton X-100 can be detected in the parts per million range by spectrophotometric measurement of the concentration of a Triton-ammonium-cobalt-thiocyanate complex.⁹ Interfering substances in this assay have been discussed.¹⁵

For a given application, the choice of a suitable surfactant depends on a number of variables, from its solubility, polarity and micelle size to the mechanism of its action with the target solute. The literature contains numerous articles:¹⁰⁻¹³

- Choice of detergent for solubilization of (erythrocyte) membranes¹⁰
- Effect of hydrophile-lipophile balance on (cytochrome) membrane solubilization¹¹
- Mode of interaction of polyoxyethylene glycol detergents with membrane protein¹²
- General background on surfactants and use in protein purification¹³

Preparation Instructions

Triton X-100 is soluble in all proportions at 25°C in water, benzene, toluene, xylene, trichloroethylene, ethylene glycol, ethyl ether, ethanol, isopropanol, and ethylene dichloride.¹ At 10% (v/v) in water, it gives a clear to slightly hazy solution, from clear to slightly yellow in appearance.³

Solutions are stable to autoclaving. At certain concentrations the solutions may be cloudy but dispersible above the cloud point; they should clear with stirring upon cooling.¹⁴

Storage/Stability

Triton X-100 is considered stable for years if stored sealed at room temperature. For special applications, storage under argon or nitrogen at 2-8°C may be preferred.

References

1. Supplier data (Triton X-100 is a product of Union Carbide.)
2. Wexler, A.S., *Anal. Chem.*, 35, 1936-1943 (1963).
3. Sigma data.
4. Tiller, G.E. et al., *Anal. Biochem.*, 141, 262 (1984).
5. The Merck Index, 11th ed., #6681 (1989).
6. Holloway, P.W., *Anal. Biochem.*, 53, 304 (1973).
7. Ashani, Y. and Catrovas, G.N., *Anal. Biochem.*, 109, 55-62 (1980).
8. *Enzymes of Molecular Biology*, M.M. Burrell, Ed. (Humana Press, NJ, 1993), p. 307.
9. Supplier method, based on work by Crabb, N.T. and Persinger, H.E., *J. Amer. Oil Chem. Soc.*, 41, 752-755 (1964) and Greff, R.A. et al., *J. Amer. Oil Chem. Soc.*, 42, 180-185 (1965).
10. Grant, D.A. and Hjerten, S., *Biochem. J.*, 164, 465-468 (1977).
11. Slinde, E. and Flatmark, T., *Biochem. Biophys. Acta*, 455, 796-508 (1976).
12. Le Maire, M. et al., *Eur. J. Biochem.*, 129, 525-532 (1983).
13. *Methods in Enzymology*, 182, 239-282 (1990): reviews by Neugebauer, J.M., Hjelmeland, L.M., etc.
14. Supplier information.
15. Goldstein, S. & Blecher, M., *Anal. Biochem.*, 64, 130-135, (1975).

ckv 4/21/99

Sigma brand products are sold through Sigma-Aldrich, Inc.

Sigma-Aldrich, Inc. warrants that its products conform to the information contained in this and other Sigma-Aldrich publications. Purchaser must determine the suitability of the product(s) for their particular use. Additional terms and conditions may apply. Please see reverse side of the invoice or packing slip.