

76886 Ruthenium-tris(4,7-diphenyl-1,10-phenanthroline) dichloride Ru(dpp)

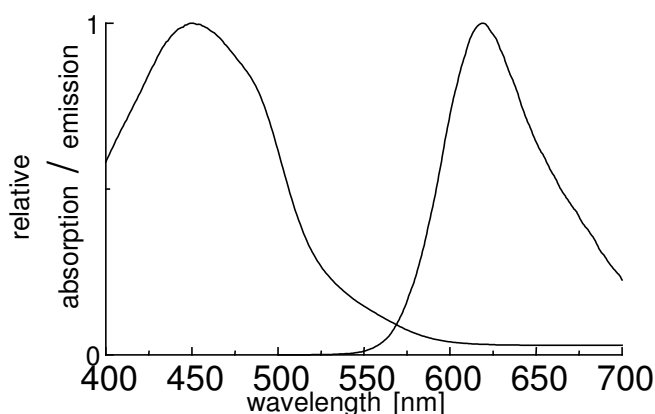
Application

Widely used probe for luminescent detection and quantitation of oxygen using (fiber) optic sensors (see below).

Product Description

Net formula	$C_{72}H_{48}Cl_2N_6Ru$
MW	1169.17
Appearance	orange solid
Solubility	soluble in ethanol, methanol, chloroform, toluene (moderately)
Quantity	1 mg, 5 mg

Absorption and fluorescence emission of Ru(dpp) in toluene solution

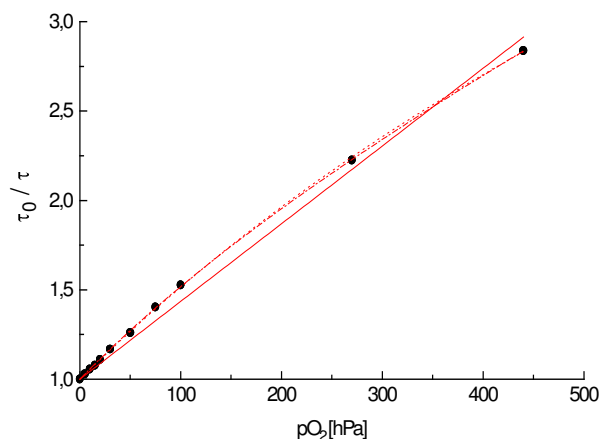


abs. λ_{\max} 455 nm, luminescence λ_{\max} 613 nm

Quenchability by Oxygen:

The fluorescence of $Ru(dpp)_3Cl_2$ is strongly reduced by molecular oxygen due to dynamic quenching. Therefore, it is a viable oxygen probe based on either measurement of intensity or decay time. Quenching usually is expressed as the ratio of the decay times in the absence (τ_0) and presence (τ), respectively, of a quencher and can be presented as a Stern-Volmer plot as shown below. The graph says that, e.g., at a partial pressure of 200 hPa the decay time (and intensity) of $Ru(dpp)_3Cl_2$ have dropped by a factor of 2 due to dynamic quenching.

The linear graph gives the ideal situation. In practice (for example if the probe is dissolved in a polymer), deviations from linearity are observed as shown in the graph.



References:

J. R. Bacon, and J. N. Demas, *Anal. Chem.* 59 (1987) 2780 and I. Klimant & O. S. Wolfbeis, *Anal. Chem.* 67, 3160-3166 (1995). Also used for studies on oxygen in skin and in skin tumors: W. L. Rumsey, J. M. Vanderkooi, and D. F. Wilson, *Science* 241 (1988) 1649 – 1651; K. Sundfor, H. Lyng, and E. K. Rofstad, *Br. J. Cancer* 78 (1988) 822; used for measurement of oxygen flux through skin: D. W. Luebbbers, T. Koster, and G. A. Holst, *Adv. Exp. Med. Biol.* 388 (1996) 59; P. Hartmann, W. Ziegler, G. Holst, and D. W. Luebbbers, *Sens. Actuators B* 38 (1997) 110; and for oxygen imaging: S. Franconi, A. Tschupp, and L. Molinari, *Eur. J. Pediatr.* 155 (1996) 1043; G. Liebsch, I. Klimant, B. Frank, G. Holst & O. S. Wolfbeis, *Appl. Spectrosc.* 54 (2000) 548; also used.