Tubulin Basics

I. Useful Values

 1 mg/ml tubulin = 10 µM (assuming MW of ab-tubulin heterodimer is 100,000; in reality it is ~110,000 but almost all tubulin labs use this convenient conversion relationship)

 1 µm of a microtubule has ~1600 tubulin heterodimers

 Extinction coefficient of tubulin at 280 nm = 115,000 $M^{-1}cm^{-1}$ or 1.15 $(mg/ml)^{-1} cm^{-1}$; assuming that the MW of a tubulin heterodimer is 100,000 daltons. This extinction coefficient was calculated from tubulin sequences and includes the contribution of the two bound guanine nucleotides to the absorbance at 280 nm.

 II. Handling Tubulin

Tubulin is a labile molecule that converts to a non-polymerizing state within hours on ice. This lability demands a certain amount of care and discipline when handling tubulin. The following is what we recommend for general use of tubulin:

 1. Tubulin is very stable at -80iC and is best stored in small aliquots at this temperature. We generally prepare tubulin in large scale and store large aliquots at -80iC. We recycle 3-4 of these large aliquots and store small aliquots of the recycled tubulin at -80iC for daily use. One or more recycled aliquots is thawed for an experiment, and any leftover material discarded. Refreezing thawed aliquots of recycled tubulin is not recommended.

 2. To use recycled tubulin, rapidly thaw the aliquot by placing it in a 37iC bath straight from the -80iC freezer (or from a liquid nitrogen dewar -- we often use liquid nitrogen to bring tubulin aliquots from the freezer to the 37iC bath/benchtop). When the tubulin is nearly thawed (i.e. when there is a very small amount of ice left in the tube) transfer the tube to an ice bucket; mix it by gentle flicking ~20s later and store on ice. Use the thawed tubulin for polymerization preferably within 30' of thawing. When quantitative analysis of tubulin polymerization is necessary, careful and consistent handling of tubulin aliquots is essential for reproducible results.