

Abstract

The recently developed 2-5 L small-volume MnO₂ coprecipitation method for determining ²³⁴Th in seawater has provided a new way to substantially increase, both temporally and spatially, the sampling resolution of ²³⁴Th and ²³⁴Th-based particulate organic carbon export estimates in the upper ocean. In this study, we further optimize the technique by reducing reagent quantities and the use of an additional water bath heating step. This optimization allows the filtration of the MnO₂ precipitate onto a 25-mm diameter, 1.0 μm pore size QMA filter to be completed within < 30 minutes for unfiltered waters from the South China Sea. In addition, we have modified the MnO₂ purification procedure to allow for alpha spectrometric measurements of ²³⁴Th recoveries. Results from recovery experiments suggest that reagent amounts can be reduced to 0.0375 mg KMnO₄ and 0.1 mg MnCl₂·4H₂O per liter of sample, while still maintaining high ²³⁴Th recovery. This study further confirms that the addition of a yield monitor is necessary for the application of the small-volume method.