

A Simple, Precise and Cost Effective PTFE Container Design Capable to Work in Domestic Microwave Oven

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Abstract : Starting from the first application of a microwave oven for sample preparation in 1975 for the purpose of wet ashing of biological samples using a domestic microwave oven, many microwave-assisted dissolution vessels have been developed. The advanced vessels are armed with special safety valve that release the excess of pressure while the vessels are in critical conditions due to applying high power of microwave. Nevertheless, this releasing of pressure may cause lose of volatile elements. In this study Teflon bottles are designed with relatively thicker wall compared to commercial ones and a silicone based polymer was used to prepare an O-ring which plays the role of safety valve. In this design, eight vessels are located in an ABS holder to keep them stable and safe. The advantage of these vessels is that they need only 2 mL of HNO₃ and 1mL H₂O₂ to digest different environmental samples, namely, sludge, apple leave, peach leave, spinach leave and tomato leave. In order to investigate the performance of this design an ICP-MS instrument was applied for multi elemental analysis of 20 elements on the SRM of above environmental samples both using this design and a commercial microwave digestion design. Very comparable recoveries were obtained from this simple design with the commercial one. Considering the price of ultrapure chemicals and the amount of them which normally is about 8-10 mL, these simple vessels with the procedures that will be discussed in detail are very cost effective and very suitable for environmental studies.

Keywords : inductively coupled plasma mass spectroscopy (ICP-MS), PTFE vessels, Teflon bombs, microwave digestion, trace element

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