NOTE

Modified Soxhlet Apparatus for High-Temperature Extraction

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ABSTRACT: Modification of a Soxhlet apparatus widely used for extraction is suggested. This modification is aimed at overcoming the main disadvantage of the Soxhlet apparatus for extraction, that the extraction takes place at around room temperature. The modified apparatus allows extraction to be performed with boiling solvent, which has obvious advantages when working with polymers. © 2006 Wiley Periodicals, Inc. J Appl Polym Sci 102: 2013–2014, 2006

Key words: Soxhlet apparatus; high-temperature extraction; polymers

The Soxhlet apparatus is an extremely convenient and effective apparatus for extracting a soluble component from multicomponent systems using a selective solvent. Its main advantage is that its design allows for a continuous cyclic treatment of a multicomponent substance with fresh solvent. At the same time, this apparatus has a serious disadvantage: the extraction takes place at temperatures close to room temperature. This peculiarity of the classic Soxhlet apparatus presumes good solubility (at room temperature) of the extractable component.

Because polymers are generally characterized by rather poor solubility (even at elevated temperatures), the effective application of the Soxhlet apparatus in its original construction for polymer extraction is rather limited.

Basically, heating of the solvent in the original Soxhlet device, where the extraction takes place, is possible by using external electrical heating elements surrounding the Soxhlet or via reconstruction of the original Soxhlet apparatus, enabling heating of the volume to be extracted using, for example, a separate bath. Both modifications of the Soxhlet apparatus have obvious disadvantages.

The modification of the Soxhlet apparatus shown in Figure 1 is quite compact and very convenient to use.

The suggested modification still has the main advantage of the original Soxhlet apparatus, allowing extraction of samples in a cyclic way with fresh solvent, while simultaneously allowing the extraction process to occur at elevated temperatures, including boiling of the solvent.

Depending on the sample and if the desired component is the extracted substance or the residue remaining after ex-

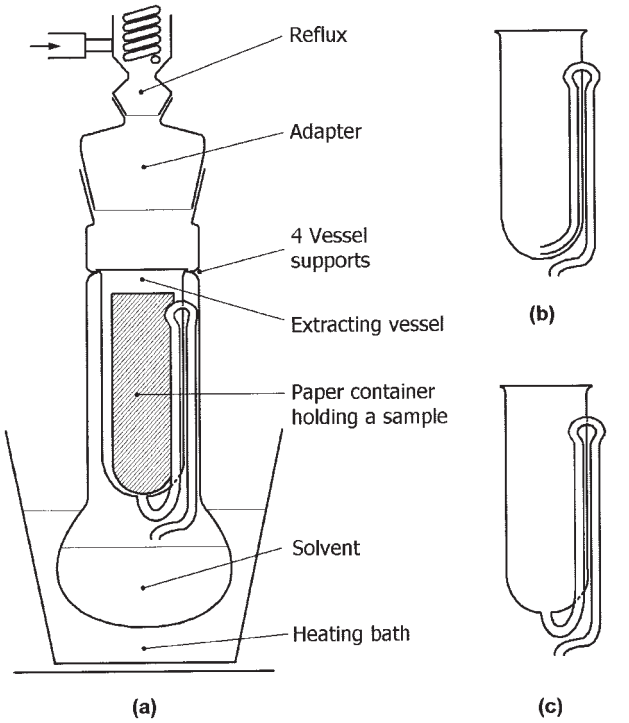

Figure 1 Modification of a Soxhlet apparatus for extraction at elevated temperatures: (a) general view, (b) extraction vessel with the siphon inside, (c) extraction vessel with the siphon outside.

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traction, the solution from the main flask will then be treated appropriately for the isolation of the extracted substance, or the residue after the extraction will be used.

To illustrate the effectiveness of the suggested modification of the Soxhlet apparatus (Fig. 1), it seems appropriate to mention that Perilla and Jana[1] recently reported that the extraction of polystyrene (PS) from its blends with polypropylene (PP) with toluene using a Soxhlet extraction setup took place for 48 h. Similarly, Clark and Lee[2] needed 24 h for extraction of ungrafted monomer from polypropylene-*graft*-maleic anhydride with a Soxhlet apparatus containing methanol.

Using the new modification (Fig. 1), the extraction of PP from its blends with poly(ethylene terephthalate) took only 30 min. The extraction of PS[1] and PP was performed in order to prepare samples of a polymer residue for electron microscopic inspection.

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References

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