

Ultrasound-Based Acetone/Pentane Precipitation for the Purification of Paclitaxel

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Abstract

In this study, the purification efficiency of paclitaxel was remarkably improved through ultrasonic acetone-pentane fractional precipitation. The time taken for precipitation was also shortened by a maximum of 192-fold (at 5 °C, 180-250 W) with ultrasound as compared to that of the conventional method. The precipitation was completed within 30 min regardless of temperature (5-25 °C), thereby improving the operating conditions (precipitation time and temperature) as compared to the conventional method. In addition, the rate constant in the fractional precipitation with ultrasound (80-250 W) was also increased by 8- to 13-fold (at 5 °C) as compared to the conventional method. It was found that the cavitation bubble itself acts as a nucleation site, which accelerates nucleation and thereby improves fractional precipitation efficiency. The standard enthalpy change and standard entropy change were negative, while the standard Gibbs free energy change was positive. These results indicate that the precipitation process was exothermic, irreversible, and non-spontaneous.