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Novel: Time optimization model for centrifugation process: Application in human blood-plasma separation

Abstract

One way to accurately diagnose many human diseases is to conduct tests on a sample of blood. These tests are based on analyzing precisely the results of a blood plasma sample free from any other blood cells. This article develops a mathematical model for the separation efficiency of laboratory centrifuge controller. Multi-decay power pulses through a blood sample to determine separation efficiency that provides accurate attenuation measurements. Ultrasonic attenuation measurements were obtained for human blood-plasma of 1 ml volume for concentrations of 20%, 35%, 55%, 80% and 95% plasma by weight. The separation efficiency measurements were obtained for a time period of 5 min divided into 0.5 min. attenuation measurements for separation efficiency greater than 95% may prove useful for process control to decrease spinning time and power consumption. The data shows the feasibility of producing a separation efficiency of 95% plasma for 0.35 ml of 1 ml blood for 3.1 min. It can be shown that such measurements may prove useful in reducing the centrifugation time with high separation precision.

Keywords

Attenuation; Separation efficiency; Time of centrifugation process