Portable Water Bath to Support Nanofibrils Processing

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Abstract. Nanofibrils are nano-sized fibrils made from protein isolates. To make the nanofibrils that protein isolate solution was heated in a water bath at 80 oC while stirring for more 16 h. This nanofibril formation process requires a water bath that can heat and stir protein isolates. So far there have been a lot of stirrers and water baths, but those that can heat and stir together simultaneously are very limited. Therefore it is necessary to design a water bath that can be paired with a stirrer so that it can heat and stir continuously. The portable water bath designed includes the chamber, heater, thermostat and control panel. This water bath works in a temperature range of 50^{o}C -100^{o}C. Water bath can be paired with heater.

1. Introduction

Nanofibrils is globular proteins including whey proteins, soy proteins and egg white proteins self-assemble into fibrillar structures with several nanometers thickness and several micrometers length by prolonged heating at very acidic conditions [1-7]. Nano fibrils formed long and straight with a few nanometers of diameter, as previously reported by [5], [8], and [9].

Nano fibrils is biomaterial that can formed shell of microcapsules [8-10]. Ther nanofibrils potential as gelling agents and thickener in food; e.g. juice and pudding. The Nano fibrils also hold an opportunity to enhance food texture. Nanofibrils were formed from soy isolate protein (SPI) or whey protein isolate (WPI). This isolate protein solutions heated in a water bath at 80 ^{o}C while stirring for 16 h. So, portable water bath that paired with stirer is needed in this process. This research aim to design portable water bath to support nanofibrils processing.

2. Materials and Methods

2.1. Materials

Materials used in design were chamber, heater bar, electric swicth, thermostat, indicator lamp, stecker and cable (Fig.1). Material used in nanofibril processing is soy protein isolate, HCl 37% and double distilled water.

Figure 1. thermostat.

Figure 2. heater bar.

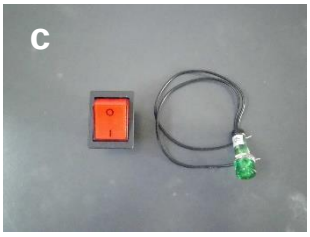

Figure 3.swicth and lamp indicator

2.2. Preparation of protein nanofibrils

SPI was formed into nanofibrils following the method of [9] and [10]. SPI suspensions were prepared by dispersing 2 %w/w of the proteins in double distilled water. The protein suspensions were stirred overnight to complete hydration and then, the pH was set to 2.0 using 6 N HCl solution. The protein suspensions at this pH were then heated in a water bath at 80 ºC while stirring for 16 h (figure 2).

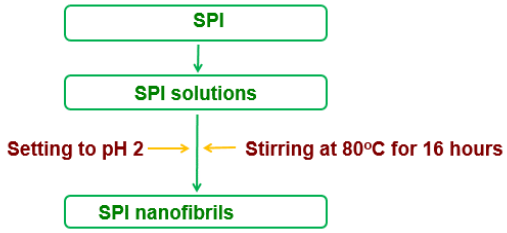

Figure 4. Nanofibrils preparation

3. Results and Discussion

3.1. Portable water bath

Portable water bath show in figure 3. The Portatble water bath consist of chamber, heater bar, themostat, swicth and indicator lamp. The chamber is made of non-magnetic stainless so that it does not interfere with the stiter process using a magnetic bar. Thermostats can be setup in a temperature range of 50 ºC to 300 ^{0}C. In water material portable water bath can work in a temperature range of 50 ºC to 100 ºC; while in media with boiling points above 100 ºC, this water bath can work in the range of 50 ºC to the boiling point of the material.

Figure 5. Portable water bath.

Portable water bath can be paired with magnetic stirers (figure 4a). The test results show that the water bath can heat water in the chamber. The time needed to heat 3 liters to 80 ºC for about 15 minutes. The heater set at 83 ºC can raise the water temperature in the chamber portable water bath to a temperature of 83 ºC and the heater off at that temperature. Heatar on at 78 ºC (figure 4b).

Figure 6. Heating process, portable water bath paired on magnetic stirer.

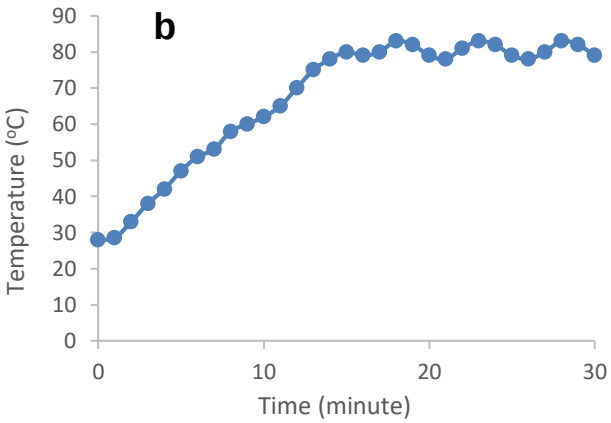

Figure 7. heating temperature graph.

3.2. Nanofibrils

SPI can be converted into SPI nanofibrils through a heating process in a water bath at 80°C and stirred for 16 hours.

Figure 8. SPI suspension

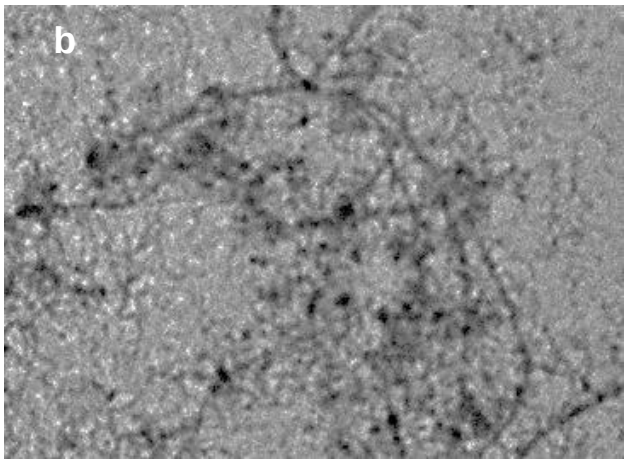

Figure 9. SPI nanofibrils image that modified from [9] (b)

The results of the observations using TEM show nanofibrils in the form of curve curves as the results of the research by [9].

4. Conclusion

The portable water bath designed includes the chamber, heater, thermostat and control panel. This water bath works in a temperature range of 50°C -100°C. Water bath can be paired with heater.

5. References

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