TITLE:

Centrifuge Retention Capacity Determination for Superabsorbent Samples

SCOPE:

This method describes the procedure for quantitatively measuring the centrifuge retention capacity (CRC) of loose superabsorbent particles (SAP).

SAFETY:

Read the material safety data sheets for all chemicals used in this procedure. Exposure to low levels of airborne SAP dust may result in lung irritation. SAP is non-irritating by skin contact and is essentially non-irritating to the eyes. However, if eye contact occurs, it is recommended that the eyes be flushed with running water for at least 15 minutes.

When testing experimental and competitive SAP with unknown levels of residual monomer, residual solvents, or residual crosslinkers, it is recommended that neoprene gloves be worn when handling the hydrated SAP.

EQUIPMENT AND MATERIALS:

1. 1. Analytical balance accurate to 0.001 grams (with cover)
2. 2. Paper tea bag (60 mm x 85 mm, Paper: Dexter No. 1234 T or equivalent)
3. 3. Heat sealer (Polystar 245, Fa.Rische or equivalent)
4. 4. Timer
5. 5. Large pan (approximately 15 cm deep and large enough to hold several tea bags, volume approximately 5 L)
6. 6. Weighing boat or equivalent
7. 7. Household centrifuge (e.g. Bauknecht Type 772N) or laboratory centrifuge capable to deliver a centrifugal force of 250 g (1400 rpm, basket d=225 mm, 230 V – 50 Hz)
8. 8. 0.9% NaCl saline prepared with distilled or deionized water
9. 9. Loose superabsorbent sample as is (full PSD)

PROCEDURE:

1. 1. Prepare two identical tea bags or use two pre-sealed tea bags.
2. 2. Rotate the sample container end-over-end several times in order to obtain a representative sample.
3. 3. Weigh 0.200 ± 0.005 g loose superabsorbent (record as **W1**) in a weighing boat and transfer the sample into the tea bag. Heat-seal the open end of the tea bag.
4. 4. Repeat step 3 for the second tea bag.

   Note: If it takes longer than 5 minutes to prepare the superabsorbent-containing tea bags and start the test, place the tea bags in a dessicator.

5. 5. Fill the pan with 0.9% saline. The temperature of the saline should be consistent at about 22 ± 2 °C (this is not required if the test is being completed in a temperature and humidity controlled room).

   Note: The saline in the pan should be changed after every 6 tea bags per one liter.

6. 6. Hold the superabsorbent-containing tea bags horizontally and distribute the superabsorbent throughout the tea bag.
7. 7. Lay the tea bags on the surface of the saline. Allow the tea bags to hydrate for one minute before submerging completely. Assure that entrapped air bubbles are eliminated.

   Note: Plastic mesh, placed above the tea bags, may help keep the samples submerged.

8. 8. After a soaking period of 30 minutes (± 1 minute), remove the tea bags.
9. 9. Place the superabsorbent-containing tea bags in the centrifuge basket, in pairs. Position the tea bags in the centrifuge with each tea bag "sticking" to the outer wall of the centrifuge basket. Be careful to evenly space the bags for proper balance when spinning (especially important if more than two tea bags are being placed inside the centrifuge).
10. 10. Close the lid to activate the centrifuge and start the timer after the first revolution. Centrifuge the tea bags for 3 minutes (± 10 seconds) at 1400 rpm (250 g).
11. 11. Remove the tea bags, weigh each one, and record the weights as **W3**.
12. 12. For each batch of tea bags that were used in the sample analysis, determine the average wet blank weight by taking ten dry, sealed tea bags and performing steps 7-11. Record the weight of each wet tea bag and calculate the average wet blank weight (record as **W2**).

    Note: Step 12 should only be completed every time a new batch of tea bags is prepared by hand or each time a new box of pre-cut, pre-sealed tea bags is opened. The average wet blank weight can be used for all samples prepared within a given batch of tea bags.

CALCULATION:

$$\text{Centrifuge Retention Capacity (g/g)} = \frac{(W3 - W2) - W1}{W1}$$

W1 = weight of dry sample, in grams
W2 = weight of wet blank tea bag (after centrifugation), in grams
W3 = weight of wet superabsorbent-containing tea bag (after centrifugation), in grams

The final result is the arithmetic mean of the two measurements, provided that the difference between them is not greater than 5% of their mean value.

Report the result with no decimal place.

REFERENCE:

Edana Doc. 87/RS 7/037; Absorbency II 441.1-99