Emulsion polymerization of Styrene

Ingredients:

1. 7.1 g Styrene (l)
2. 12.8 g Water (l)
3. 3.1 ml of a 0.68% (0.34 gm in 50 ml distilled water) solution of potassium persulfate
4. 0.356 g SDS in 10 ml water
5. Magnetic stirrer/Hot plate
6. Erlenmeyer Flask 100ml with a magnetic stir bar
   (Remove the stir bar before adding salt at the end!!!)
7. NaCl to salt out the soap micelles.

Procedure:

1. Add styrene, water, potassium persulfate and soap solution to the Erlenmeyer flask and stir rapidly.
2. Heat the solution/suspension to above 50C to form free radicals from the potassium persulfate. For about 90% conversion heat for 2 hours, heating for 30 minutes leads to a reasonable yield of polymer.
3. The micellar suspension has a milky appearance but when salt is added with rapid stirring using a glass stirring rod (not the magnetic stir bar) the micelles immediately breakup and a precipitate of polystyrene forms.
4. Water/monomer etc. can be decanted from the precipitate and the polystyrene dried.
5. The product can also be dissolved in toluene and precipitated in propanol as was done for the bulk polymerization.

Precautions:

1. Styrene vapors are potentially carcinogenic (still under debate, check Wiki page of Styrene). You may loosely cover the beaker while heating to reduce the release of styrene vapors. For small amounts this procedure can be conducted with no hood as long as the room is relatively well ventilated.
2. The most interesting part of this procedure is precipitation of styrene from the emulsion using NaCl which is rather dramatic.
3. The stir bar can be washed with toluene if you forgot to remove the stir bar before the salting out step.

Step 3. It is 0.68% persulfate. (0.34 g in 50ml)
Step 4. It is 0.356 gm soap in 10ml (we may add a little more)