Polymerization of acrylamide with a redox system in aqueous solution

Ingredients

1. Acrylamide
2. Ferrous ammonium sulfate (Mohr's salt). Alternatively, you can use ferrous sulfate heptahydrate.
3. Hydrogen peroxide
4. Conc. HCl
5. Distilled water

1. The first step involves dissolving acrylamide in water. This can be done in 3 different concentrations. (all beakers contain 50 ml water)
    a. In beaker 1, dissolve 1 gm of acrylamide.
    b. In beaker 2, dissolve 3 gm of acrylamide.
    c. In beaker 3, dissolve 8-10 gm of acrylamide.

NOTE: The dissolution process is endothermic. You will notice the beakers getting cold as the acrylamide is dissolved.

2. Add 0.08 g of Mohr's salt (or 0.06 g of $FeSO_4.7H_20$) to the beaker and dissolve it by stirring.
3. Add 5ml of H_2O_2 to the solution while stirring. Stir for a few seconds then let the beaker rest.

NOTE: Ferrous (Fe^{2+} salts are green in color. Adding H_2O_2 oxidizes the ferrous ions to Ferric (Fe^{3+}) ions which cause the solution to have a rusty color. The reaction produces $OH^{\bullet}$ radical which initiate the polymerization reaction of acrylamide. The polymerization process is exothermic and you will see a sharp increase in the temperature of the beaker. With time you will observe that the rusty color of the solution becomes lighter. This may be because the free Fe^{3+} ions combine with free OH^- ions to form hydroxides which are usually lighter in color.

CAUTION: There is chance of the beaker with highest concentrations to overflow because the heat released during reaction can cause the water in the solution to boil. Add more water to cool the reaction if this is needed.

4. The highest concentration will turn viscous first. (Beaker 3 > Beaker 2 >Beaker 1)
5. After 25-30 mins, take a 200 ml beaker (with a magnetic stirring rod) and add 100 ml of isopropyl alcohol. Add a few drops of conc. HCL to this beaker and place the beaker on a magnetic stirrer.
6. With vigorous agitation (ensuring no spillage), add the poly-acrylamide reaction mixture from beaker 3 drop wise to the 200ml beaker. Decant and display the polymer formed. Follow the same process for beakers 2 and 1.

SAFETY:

Acrylamide is toxic. It is a known neurotoxin in high concentration and for long exposure times. Hence proceed with caution while conducting the experiment. Wear gloves,

goggles and lab coat. Please read the wiki page of acrylamide and poly-acryalmide for more information. Acrylamide is present in cigarette smoke, pickles, coffee, fried, baked and microwaved foods, olives, prunes, dried pears, beef jerky. It is a product of browning during cooking apparently. In any case, wash you hands after this demo before you eat or smoke to be on the safe side.