

# Precipitation reactions in hydrogel balls

(Hungary)

## You will need...

### for each student or group:

- ✓ one hydrogel ball for each experiment
- ✓ a white glazed ceramic tile, glass plate or Petri dish
- ✓ two syringes fitted with hypodermic needles (assembled in advance by a teacher / technician)
- ✓ distilled water
- ✓ a pair of disposable gloves
- ✓ a pair of safety glasses.

## Reagents:

- ✓ Sodium hydroxide (NaOH) solution (1.0 M)
- ✓ Iron(III) chloride (FeCl<sub>3</sub>) solution (1.0 M)
- ✓ Nickel(II) chloride (NiCl<sub>2</sub>) solution (1.0 M), or nickel(II) sulfate (NiSO<sub>4</sub>) solution (1.0 M)
- ✓ Sodium sulfide (Na<sub>2</sub>S) solution (1.0 M)
- ✓ Potassium hexacyanoferrate(II) (K<sub>4</sub>[Fe(CN)<sub>6</sub>]) solution (1.0 M)

## Follow these steps

1. Prepare the hydrogel balls (this needs to be done in advance). Prepare the hydrogel balls (this needs to be done in advance). First, wash the hydrogel balls several times in distilled water, then leave them to swell in more distilled water for at least 2 hours. Approximately 500 ml of distilled water is needed to soak 30 hydrogel balls.
2. Place a swelled-up hydrogel ball on one white tile.
3. Fill a syringe with one of the solutions containing a heavy-metal compound (e.g. iron(III) chloride solution) and inject a small amount of reactant into the centre of the ball.
4. Fill the next syringe with sodium hydroxide solution and inject a similar amount into the hydrogel ball through the same hole.
5. As the reaction proceeds, observe the colour change and record what you see. You should observe a coloured, solid precipitate form inside the ball.
6. Using another hydrogel ball, repeat the experiment with the next heavy-metal compound (e.g. nickel(II) chloride solution), again reacting this with the sodium hydroxide solution.
7. Continue repeating the experiment with the other reagents:
  - nickel(II) chloride with sodium sulfide
  - iron(III) chloride with potassium hexacyanoferrate
8. Finally, compare the results of the different precipitation reactions.

## So what happened?

The equations and colour changes for these reactions are:

