

A misty way to see convection currents

Instructions for the experimental setup

Construct the DIY humidifier

Skip this if using a ready-made home-use humidifier

Materials

- Ultrasonic mist maker
- Rectangular plastic/glass container
- Small USB fan (5 V DC)
- Corrugated plastic board
- Penknife
- Sticky tape

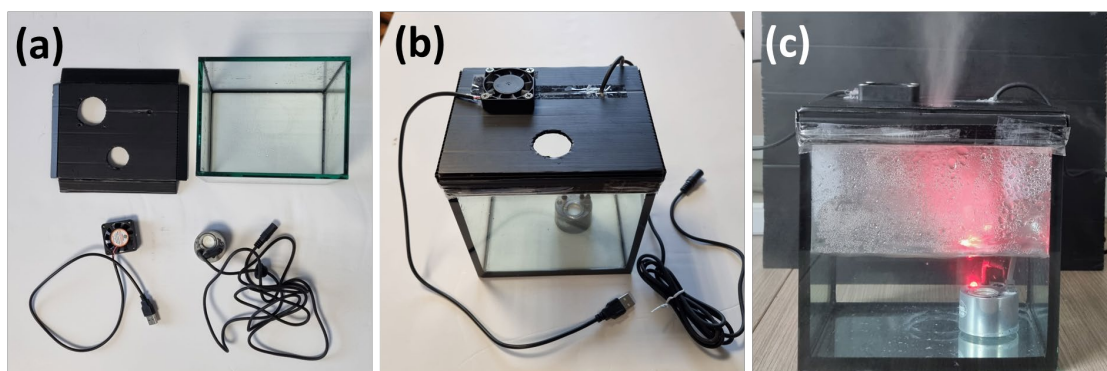


Figure 1: Make your own humidifier. (a) Assemble the materials. Form a lid with the plastic board and cut holes for the fan and output. (b) Assemble the mist maker and fan to form the humidifier. (c) The humidifier in action

Images courtesy of the authors

Procedure

1. Form a lid for the container with the plastic board. With a penknife, lightly score (do not cut through) a rectangle the size of the top of the container. Cut away the corners to create a flap on each side.
2. Cut a circular hole with a diameter slightly smaller than that of the fan.
3. Cut a 5 cm line from the edge of the hole.
4. Cut another hole to fit a PVC pipe.
5. Fit the mist maker through the hole for the fan, and push the wire across the line cut. Tape across the line cut.
6. Insert the mist maker into the container and cover with the lid. Tape the sides of the lid.
7. Screw the fan onto the lid. The fan should blow into the container.
8. Pour water into the container to about 3 cm above the mist maker.
9. Connect the fan and mist maker to their DC power sources to test. Figure 1 shows the DIY humidifier in action.

Construct the enclosure and assemble the components

Materials

- Small electric heater (3 cm × 4 cm, 5 V DC, 60°C)
- Aluminium sheet (6 cm × 7 cm × 1 mm)
- Transparency (plastic) film (15 cm × 15 cm)
- Cardboard box
- Plastic sheet (area to match the cardboard box)
- Black corrugated plastic boards
- PVC pipes and joints
- Humidifier
- Sticky tape

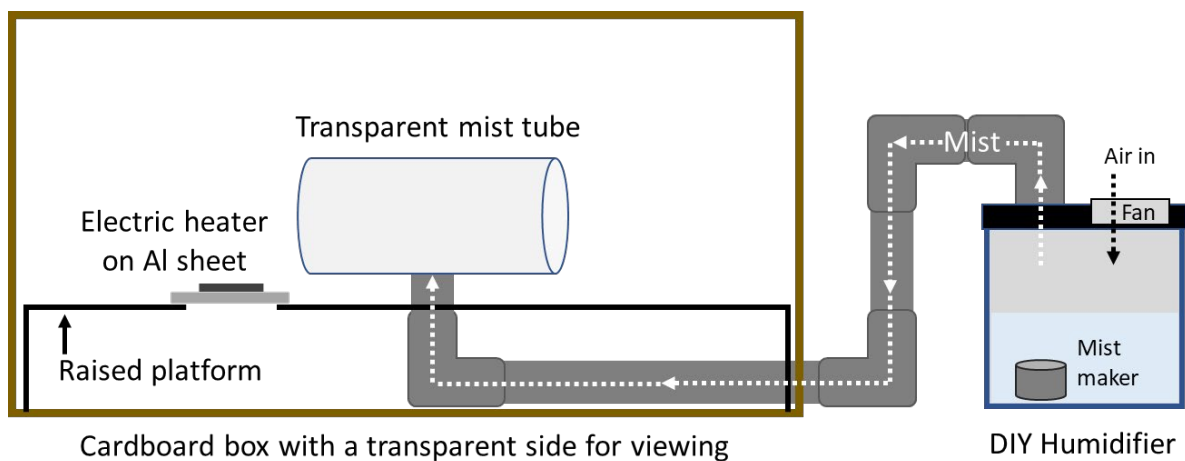


Figure 2: Schematic illustration and photograph of the complete setup
Image courtesy of the authors



Procedure

1. Cut away one face of the box, leaving a 4 cm border at the edges.
2. Line the insides of the box with black plastic boards.
3. Create a raised platform using corrugated plastic board. Cut a circular hole in the centre to fit the PVC pipe and a rectangular hole slightly smaller than the aluminium sheet.
4. Place the heater and aluminium sheet in the rectangular hole and secure with tape.
5. Make a slit in the side of the box and feed the USB cable out of the box.
6. Cut a circular hole at the centre of the transparency film to fit the PVC pipe into.
7. Roll the film and tape the two opposite ends to form a tube.
8. Use the PVC pipes and joints to form a mist pipe that connects the humidifier to the box.
Cut a hole in the box to run the pipe under the raised platform.
9. Fit the mist output tube on top of the PVC pipe in the box.
10. Cover the open side of the box with clear plastic film.
11. Make a slit in the top of the box to allow mist to escape.