

## CHAPTER IV EXPERIMENTAL

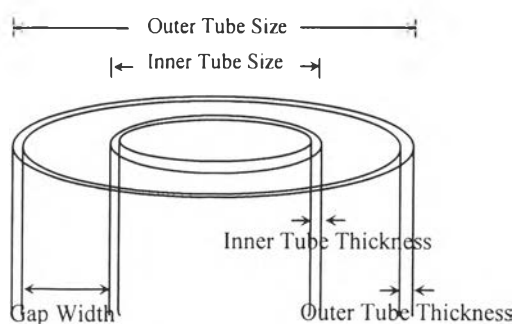
### 4.1 Materials and Equipment

#### 4.1.1 Distilled Water

Distilled water was used as the specimen chemical.

#### 4.1.2 Annular Tubes

Annular tubes were Pyrex borosilicate cylindrical tubes which their dimensions are specified in Figure 4.1 and Table 4.1, respectively.



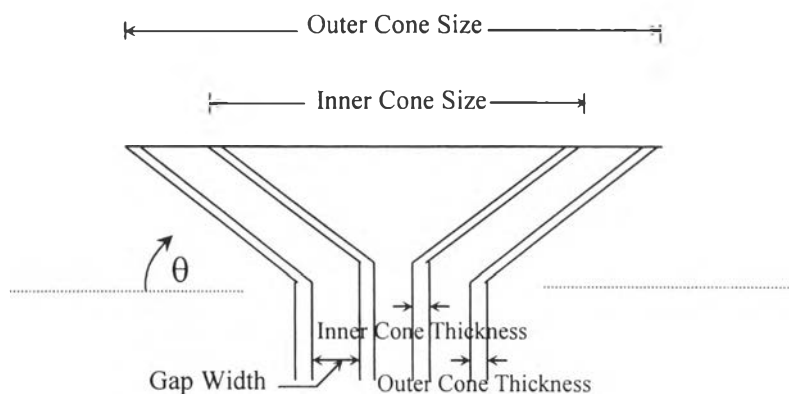
**Figure 4.1** The annular tube composition.

**Table 4.1** The annular tube specifications

<b>Inner/Outer Tube Size (mm)</b>	<b>Inner/Outer Tube Thickness (mm)</b>	<b>Gap Width (mm)</b>
7/10	1/1	0.5
10/15	1/1	1.5
15/20	1/1	1.5

#### 4.1.3 Annular Cone

Annular cone was Pyrex borosilicate cylindrical tubes. The dimensions is shown in Figure 4.2 and Table 4.2, respectively.



**Figure 4.2** The schematic diagram and the composition of annular cone.

**Table 4.2** The annular cone specifications

Angle	Inner/Outer Cone Size (mm)	Inner/Outer Cone Thickness (mm)	Gap Width (mm)
45°	7/10	1/1	3.0

#### 4.1.4 Cathetometer

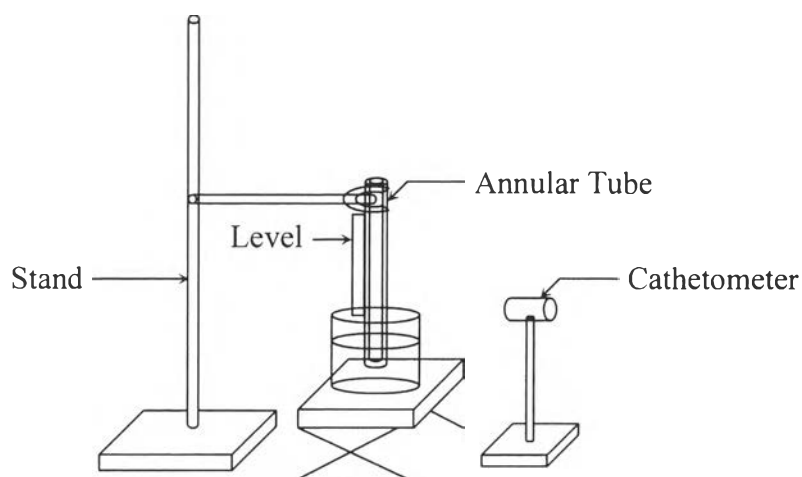
A cathetometer was used to observe the height of water rising in annular tubes. Meanwhile, the cathetometer (Model TC-II, Titan Tool Supply Inc., New York, USA) is a highly precision optical instrument for measuring vertical displacement with an accuracy of 0.0001 mm/cm. It is a micro-telescope, which has a simple cross hair recticle mounted in the eyepiece and is attached to the digimatic height gauge (Model 192-631, Mitutoyo, Japan) with an accuracy of  $\pm 0.002$  mm.

## 4.2 Experimental Conditions

Experiments were carried out at  $25 \pm 2^\circ\text{C}$ , and ambient pressure of 1 atm.

## 4.3 Methodology

The annular tube was attached to a level, which was held by a stand, so that the tube could be adjusted to a vertical alignment. Then, it was dipped into distilled water in a beaker. The height of the rising liquid was observed simultaneously until it reached equilibrium when the height was constant. Pictures of the meniscus were taken and the height of the capillary rise was observed by using the cathetometer. An illustration of experimental set up is shown in Figure 4.3.



**Figure 4.3** Experimental set up for a capillary rise in an annular tube.

Consequently, inclined annular tube and annular cone were performed in the same protocol while the angle ruler and angle iron were used to set annular tube to the assigned positions of  $30^\circ$ ,  $45^\circ$  and  $60^\circ$  inclination.