



Water Content by Gravimetric Determination

Overview:

A key characteristic of a hydrogel material such as those used for the fabrication of soft contact lenses is its equilibrium water content. This is the amount of water the material is able to absorb when it is placed into an aqueous environment. The water content will have a major influence on a range of properties including oxygen permeability, refractive index and mechanical characteristics. It is therefore essential to determine accurately the water content of a material to ensure it is suitable for the intended application. The water content by weight is determined using a procedure based upon the guidance specified in the following standard.

ISO 18369-4:2006 Ophthalmic Optics - Contact lenses - Part 4: Physicochemical properties of contact lens materials.

Specifically this corresponds to section 4.6.2 Gravimetric determination of water content of hydrogel lens by loss on drying using an oven. Although this standard is directed towards contact lens materials, it is suitable for the evaluation of any hydrogel material.

Water content is expressed as

$$\text{EWC} = \frac{\text{Weight of water in hydrated gel}}{\text{Total weight of hydrated gel}} \times 100$$

Procedure:

Sample lenses are removed from saline and are carefully blotted to remove excess water. Care should be taken to remove all excess surface water without removing any water from within the material. The hydrated test specimen is then weighed to the nearest 0.1 mg as quickly as possible to avoid loss of water from the sample by evaporation. The hydrated sample is placed in an oven and dried until constant weight is achieved. The samples are removed from the oven and placed in a desiccator to cool to room temperature. The sample is then weighed and the process repeated until a constant weight is recorded.

The equilibrium water content for each of the sample discs is calculated using the following equation.

$$\text{Equilibrium water content (\%)} = \frac{(W_h - W_d)}{W_h} \times 100$$

Where

W_d is the dry weight of the sample

W_h is the hydrated weight of the sample disc