

Experimental Details:

Method: First the polymer fiber is rinsed with distilled or deionized water. To achieve wetness on the surface a commercially available wetting agent (C-22 wetting solution) was used. A 10ml of concentrated wetting agent was mixed with 500ml of distilled water and has been applied to the sample about a minute before rinsing it with water. The adhesion of silver coating was greatly improved by using a palladium stannous based sensitizer (No.93 sensitizer solution) prior to the deposition of silver. A 10ml of concentrated sensitizer was mixed with 500ml of distilled water and has been applied to the sample about 45 to 60 seconds. Finally, the polymer fiber is rinsed with distilled water.

After the application of sensitizer, it is very important to silver the sample, immediately. For the silver deposition on nano fibers, the silver solution (HE 300-A), activator solution (HE 300-B) and reducing solution (HE 300-C) were used. Silver solution consists of silver nitrate and ammonium hydroxide, whereas the activator solution consists of sodium hydroxide and ammonium hydroxide. When silver nitrate combines with ammonium hydroxide, it reduces to silver diammine complex. The addition of sodium hydroxide to silver diammine solution improves the adhesion and hardness of the silver film. A 5ml of concentrated silver solution was diluted in 500ml of distilled water. The silver solution thus obtained was photosensitive and was covered with an aluminum foil to prevent the precipitation of silver metal.

The reducing agent consists of dextrose and disodium salt of ethylenediamine tetra acetic acid. A 5ml of concentrated reducing agent was mixed with 500ml of distilled water. When the silver solution combines with reducer solution, dextrose reduces silver diammine complex to silver. The solution that contains silver and reducer in 1:1 ratio has to be applied on the sample about 3 to 4 minutes. The formation of silver film involves the kinetic process of condensation, nucleation and growth. Initially, small clusters of silver atoms precipitate on the surface of the sample. The clusters grow and coalesce, ultimately forming a continuous silver coating. When adequate silver film has deposited, sample was rinsed with distilled water thoroughly. The thickness of the silver film can be varied by changing either the concentration of the solution or the coating time.

Silver solution contains:

(1) Silver Diammine Complex 25%-30% (wt %)

ACGIH TLV: 0.01 mg/m³

CAS NO.: 23606-32-8

(2) Ammonium Hydroxide 10%-15% (wt %)

ACGIH TLV: 35 mg/m³

CAS NO.: 1336-21-6

(3) Water 65%-55% (wt %)

CAS NO.: 7732-18-5

Activator solution contains:

(1) Sodium Hydroxide 10% (wt %)

OSHA PEL: 2mg/m³

ACGIH TLV: 2mg/m³

CAS NO.: 1310-73-2

(2) Ammonium Hydroxide 5% (wt %)

OSHA PEL: 35ppm, 27 mg/m³ STEL 15 min

ACGIH TLV: 25ppm, 18 mg/m³ TLV, 8 hour TWA

CAS NO.: 1336-21-6

Reducer solution contains:

(1) Formaldehyde: 1% (by weight)

OSHA PEL: 0.75ppm, 0.92mg/m³, 8 Hr. TWA, STEL 2ppm, 2.5mg/m³

ACGIH TLV: Ceiling: 0.3ppm, 0.37 mg/m³, AZ

CAS NO.: 50-0-0

(2) Trade Secret < 1 % (by weight)

Sensitizer solution contains:

(1) Propyl Alcohol Percent by weight: 20

OSHA PEL: 200ppm

ACGIH TLV: 200ppm

CAS NO.: 71-23-8

(2) Hydrochloric Acid Percent by weight: 5

OSHA PEL: 5PPM

ACGIH TLV: 7mg/m³

CAS NO.: 7647-01-0

(3) Stannous Chloride Percent by weight: 5

OSHA PEL:

ACGIH TLV: 2.0mg/m³ as Sn

CAS NO.: 10025-69-1

(4) Trade Secret Percent by weight: < 5

CAS NO.: Trade Secret

(5) Water

CAS NO.: 7732-18-5 Percent by weight: 65-70

Wetting solution contains:

Vendor: Peacock Laboratories

Catalog # C-22 wetting solution

Trade Secret CAS No: N/A

Experimental Details: