SMART MATERIAL
Advanced Piezo Composites

Technical Note

Related Product:	**PZT Tubes**
Topic described:	**Electroless Plating of PZT tubes**
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1 Motivation

A conductive layer is often required on PZT (lead zirconium titanate) ceramic tube material, to allow soldering. This technical note is using the standard Smart Material tube with 1.1 mm OD and 0.5 mm ID and about 10cm long. Plating is required inside the bore.

2 Procedure

These chemicals were used in this order:

1. Solvent preclean 2 minutes (acetone soak).

2. Pre-clean 2 minutes in a RT hydroxide solution (10 g NaOH in 100 ml water). Double beaker RT rinse. Use canned air to blow bubbles in the tube.

3. Buehler Pre-Clean (msds 20dd6310, 22284549), at RT, 5 to 30 seconds (used 30 seconds). Double beaker RT rinse. Use canned air to blow bubbles in the tube.

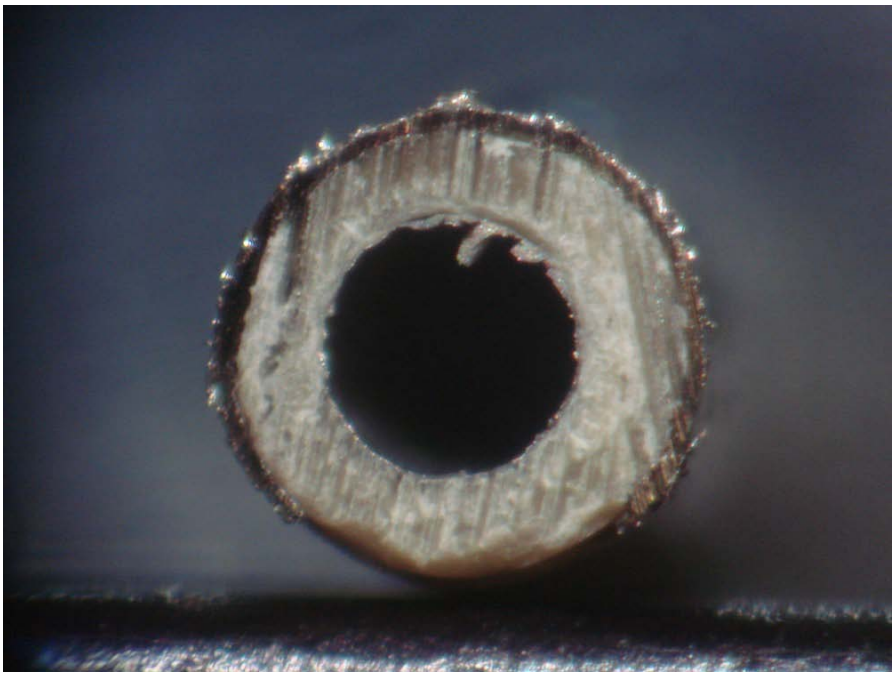
4. Sensitizer, Tin Chloride (20 g/L, msds 25cc2558, 9751809), hydrochloric acid (40 mL/L, msds 20dd4457, 22265012), and water to make the liter. A 200 mL batch is 4.0 g $SnCl_2$, 8 mL HCl, and water, 68 to 77 F, 1 to 3 minutes (used 2.5 minutes). Double beaker RT rinse. Use canned air to blow bubbles in the tube. Rinse well: drag-out will kill the nucleater.

5. Nucleater, Palladium Chloride (0.25 g/L, msds 20dd6198, 22282674), hydrochloric acid (2.5 mL/L, msds 20dd4457, 22265012), and water to make the liter. A 200 mL batch was 0.05 g $PdCl_2$, 0.5 mL HCl, and water, 68 to 104F, 30 to 60 seconds (used 45 seconds). Double beaker RT rinse. Use canned air to blow bubbles in the tube. Rinse well, drag-out will kill the nickel chloride plating bath.

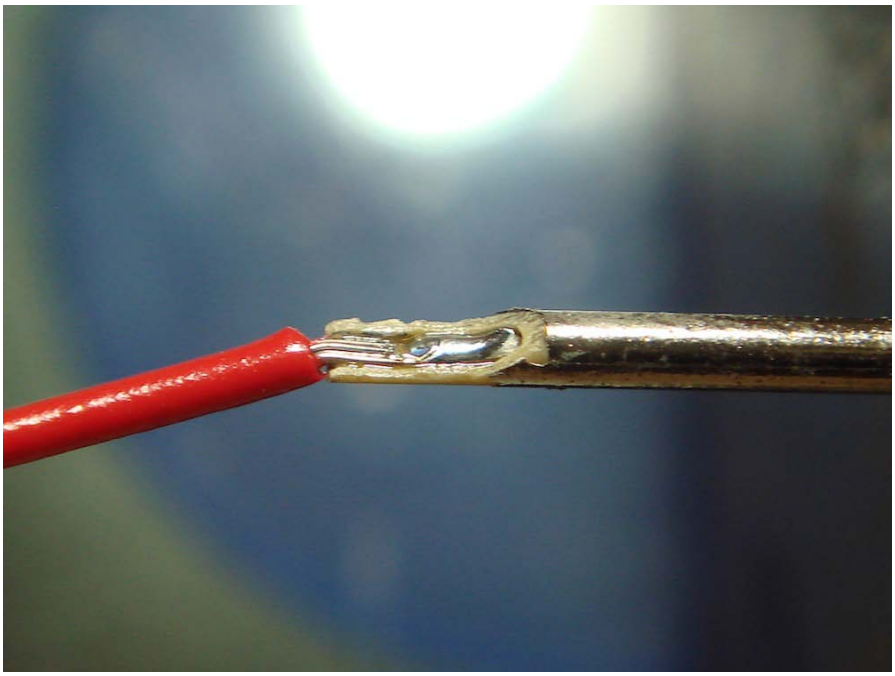
6. Buehler “Edgemet Kit,” 20-8192: Solution A: nickel chloride (msds 20dd2349, 22284555, 5 to 10% NiCl), Solution B: sodium hypophosphite (msds 20dd2350, 22284553). Buehler says it deposits 0.001” in 2 hours at 185 F. Bath life about 4 hours (plates out to beaker). Ran parts 1 hour. Double beaker RT rinse. Use canned air to blow bubbles in the tube.

7. A soak in ethyl alcohol for several minutes followed, using canned air to blow bubbles in the tube, followed by natural air drying.

3 Pictures of plated tubes



Cross section of tube plated on the outside and inside



Wire soldered to inside plating