



OS - 444

Carbonate Developer

I. Description

OS - 444 is a specially formulated and purified product for use in developing aqueous and semi-aqueous dry film photopolymers. OS - 444 is a concentrated solution of potassium carbonate, providing a developer solution easier to control than solutions made with solid materials.

OS - 444 contains inhibitors that prevent carbonate deposits from building up inside the machine. It also cleans out old deposits, typically difficult to remove. The machines using OS - 444 do not require frequent cleanings. OS - 444 provides an economical, easy to use solution for development of aqueous dry films. When combined with an appropriate solvent, it can be used equally well for semi-aqueous development.

II. Operating Parameters

Make-Up

	<u>OS - 444 Concentration (as % K_2CO_3)</u>			
	<u>0.5 %</u>	<u>0.75 %</u>	<u>1.0 %</u>	<u>1.25 %</u>
OS - 444	1.1%	1.6%	2.1%	2.6%
Water	98.9%	98.4%	97.9%	97.4%

Temperature	80 to 90° F (27 to 32° C)
Immersion Time	not applicable
Process	conveyorized spray equipment
Agitation	Not applicable
Ventilation	Advised
Tanks	Polypropylene, CPVC, Stainless Steel
Racks and Baskets	Not applicable
Heaters	Stainless Steel or quartz heater. Stainless steel cooling coil recommended.

III. Physical Properties

Specific gravity	1.38 – 1.40
Appearance	Clear
pH	11.0 to 11.4
Odor	none
Flash Point	none
Potassium carbonate	470 grams / liter (concentrate)

IV. Control Procedures

Refer to the appropriate data sheet for the dry film photoresist being developed for optimum developer concentration. Make up the solution according to the table above. Heat the OS - 444 developer solution to the appropriate temperature before processing. Antifoams such as BB200 or BB300 may be used as needed to control excess foam.

OS - 444 bath control can be accomplished by titration (for fresh make-up); and for a working bath, by pH monitoring and visual observation of development speed. The pH of a 1% (as K_2CO_3) OS - 444 bath is 11.0 - 11.4 on makeup. As the solution is used, the pH will drop to pH 10.5 or lower at which point the solution should be discarded. With automatic replenishment systems, the pH is maintained between 10.6 - 10.8. Development time depends on temperature, equipment, and photoresist type and thickness. Optimum conditions for aqueous resist development is normally a breakpoint at 50-65% of the chamber length.

Additions of OS - 444 are typically controlled by pH and/or potassium carbonate concentration. Additions can be made based on pH using the guidelines below. Please note that these guidelines are rough and are not intended to replace the controls listed above.

<u>OS - 444 Add (% vol)</u>	<u>pH</u>
0.0%	10.8
0.2%	10.7
0.5%	10.6
0.9%	10.5

V. Analysis

Determination of total potassium carbonate concentration

Reagents and Equipment:

- 1 0.1 N hydrochloric (HCl) or sulfuric acid (H_2SO_4).
2. 1% Methyl orange indicator solution.
3. 10 ml pipette
4. 50 ml burette
5. 250 ml beaker

Procedure:

1. Pipette a 10 ml sample with 50 ml DI water in a 250 ml beaker.
2. Add 5-10 drops methyl orange indicator solution.
3. Titrate with 0.1 N acid until the color changes from yellow to pink-orange.
4. Calculation:

$$\text{Potassium carbonate (\% wt)} = (\text{ml acid}) \times (\text{N acid}) \times 0.69$$

VI. Safety and Storage

OS - 444 is a highly alkaline solution. It can cause severe burns. Avoid contact with eyes, skin, and clothing. Do not inhale or swallow. Eye contact can cause severe burns or loss of sight. Use with adequate ventilation and proper protective equipment. Rubber gloves and chemical safety glasses are recommended safety equipment. Do not eat or drink while handling this product, and wash thoroughly after using it.

In case of eye contact - flush with warm water for 15 minutes. Call a physician for treatment for exposure to sodium hydroxide immediately. Skin contact - flush thoroughly with water. Contaminated clothing must be removed and washed with vinegar before reuse. Mist can cause severe burns to eyes, skin, and the respiratory tract. Avoid breathing mist and use in a well-ventilated areas. Inhalation-remove patient to fresh air and consult a physician. Ingestion - HARMFUL IF SWALLOWED. Do not take internally. If swallowed, DO NOT INDUCE VOMITING. Give plenty of water, followed by at least 50 ml vinegar or lemon juice in 50 ml water. Call a physician for further treatment immediately.

OS - 444 is indefinitely stable. Storage between 10° and 40°C is preferred. Prolonged storage at low temperature may cause solids to crystallize out of solution. This material will redissolve upon heating and stirring. Do not store in contact with acidic materials. Avoid contact with aluminum, tin, zinc, and alloys of these metals. Keep containers closed when not in use. Do not cross contaminate containers--always use clean scoops, buckets, and pumps.

VII. Waste Treatment

In case of spill, neutralize material with dilute acid and flush to drain. Alternatively, contain spill with absorbent material and scoop into approved waste disposal container for safe disposal or treatment. Consult with local officials for waste disposal regulations. Please ask a Florida CirTech technical sales rep. for more information regarding waste treatment of this chemistry and our complete line of waste treatment chemistry if additional help or information is desired.

VIII. Miscellaneous

OS - 444 is available in 5-gallon pails and 55 gallon drums. Consult the MSDS for additional information.

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