

Journey through the Solder Mask Process, Part I: Mixing and Pre-cleaning

Typically, Taiyo's solder mask products consist of two components, a resin and a hardener. Single-component products are available but three-component or more are not. The resin and hardener of PSR-4000 BN Green, for example, are packaged separately in pre-measured containers in a ratio of about 2-to-1, respectively. Solder mask mixing commences with the addition of the hardener to the resin. A mixing spatula is used to assist in moving as much of the hardener as possible to the resin container. The mixing can be performed manually or mechanically. If you're going to mix the solder mask manually with a mixing spatula, then it is highly recommended that a rounded-edge instead of the standard flat-edge spatula be used. Why? A flat-edge spatula can scrape off tiny fragments of plastic from the container, and the circuit boards will end up with these tiny plastic fragments coated on them. When mixing mechanically, care should be taken not to mix too quickly. Mechanical mixing at high speeds can cause shear thinning of the solder mask. Use a low setting on the mixer, otherwise the decrease in viscosity can cause non-uniform coating and coverage issues downstream. The duration of the mixing should be maintained between 10 to 15 minutes to assure a uniform and homogenous mixture. Pot life is about 3 days at room temperature.

With the solder mask ready to go, we need to prepare the circuit board for solder mask coating by cleaning and roughening the panel's surface. Cleaning is to remove any grease, impurities, or oxidation from the panel. Roughening is to create topography for optimal adhesion between the solder mask coating and the PCB copper surface. The two most popular pre-cleaning methods are mechanical surface preparation and chemical surface preparation. The mechanical method process begins with the panel surface being cleaned using an acid wash, usually done by dipping the panel in a 10% sulfuric acid bath for several seconds, and is followed by a fresh water rinse. The panel surface is then roughened using a 25% concentration, 4F pumice or 20% concentration, 400 grit aluminum oxide. The pumice or aluminum could be jetted, buffed, or brushed on the surface. The chemical method involves a micro etch, which is a persulfate and de-ionized water mixture. Micro etch is a versatile method in that at low concentrations it pre-cleans the circuit boards well and at high concentrations it can be used to etch the boards. Its effectiveness is in preventing panel warpage, particularly in mixed technology boards (signals on one side and ground planes on the other) where pumice or aluminum scrubbing will cause a warping towards the ground plane side. Whether mechanical or chemical, pre-cleaning is a critical step. How well this step is performed will determine how well the solder mask will adhere to the PCB surface.