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# ALN44 Dielectric Composition

Thick Film Composition/ Data Sheet

All values reported here are results of experiments in our laboratories intended to illustrate product performance potential with a given experimental design. They are not intended to represent the product's specifications, details of which are available upon demand.

## Product Description

ALN44 is a Pb-free, crystalisable thick film dielectric paste and is an integral element of the system developed for use on aluminium nitride (AlN) substrates. It is a versatile dielectric for use in both high reliability and low cost MCM and hybrid interconnect applications.

## Product Benefits

- **Compatible with DuPont ALNxx conductors**
- **Thin, 2 print, hermetic dielectric film**
- **High resistance to E.M.F. bilistering and shorting**
- **Robust electrical and mechanical properties**

## Processing Compatibility

Whilst DuPont has tested this composition it is impossible or impractical to cover every combination of materials, customer processing conditions and circuit layouts.
It is therefore essential that customers thoroughly evaluate the material in their specific situations in order to completely satisfy themselves with the overall quality and suitability of the composition for its intended application(s).

## Substrates

Properties are based on tests of the dielectric on alumina nitride substrates. Substrates of other compositions and from various manufacturers may result in variations in performance properties.

## Printing

The composition should be thoroughly mixed before use. This is best achieved by slow, gentle, hand stirring (to avoid air entrapment) with a clean burr-free flexible plastic spatula for 1-2 minutes. Metal spatulas are not recommended as they may abrade the plastic jar causing contamination of the composition.
Printing should be performed in a clean and well ventilated area. Additional information on requirements for printing areas is contained in DuPont Technical Guide EUT 7.3 "Processing - Screen Printing Rooms", available on request. Note: optimum printing characteristics are generally achieved in the room temperature range of 20°C-23°C. It is therefore important that the material, in its container, is at this temperature prior to commencement of printing.

### Composition Properties

| | |
|---|---|
| **Viscosity [Pa.s]** (Brookfield 2x HAT, Utility cup & spindle (SC4-14/6R, 10 rpm, 25 ± 0.2°C) | **80 - 120** |
| **Coverage: ($cm^2/g$)** (Based on a fired thickness 30µm) | **≈ 55 - 65** |
| **Thinner** | **4553** |
| **Shelf life [months]** | **6** |

### Processing Conditions

| | |
|---|---|
| **Printing** | The combined fired thickness of the dielectric should be at least 30µm This can generally be achieved by printing the individual layers with a 230-280 mesh stainless steel screen |
| **Drying** | Allow filled through holes to level for 5-10 minutes at room temperature, then dry for 10-15 minutes at 150°C in a well ventilated oven or belt dryer. |
| **Firing** | Fire in a well ventilated conveyor furnace, in air using the standard 30 minute cycle with a peak temperature of 850°C |

### Typical Physical & Electrical Properties

| | |
|---|---|
| **Fired Thickness** [µm] | **>30** |
| **Dielectric Constant** [@ 1MHz] | **5 - 8** |
| **Dissipation Factor** [%] (@ 1MHz) | **<0.2** |
| **Insulation Resistance (ohms)** (100 VDC @ recommended thickness) | **$>10^{12}$** |
| **Leakage Current** [$\mu A.cm^2$] (Standard measurements made after 5min @ 10VDC) | **<1** |
| **Breakdown Voltage** [V/25µm] | **>1000** |

 

## Drying

Dry in a well ventilated box oven, belt or conveyor furnace. Air flows and extraction rates should be optimized to ensure the complete removal of solvent from the paste. Refer to table - "Processing Conditions"

## Firing

Fire in a well ventilated belt, conveyor furnace, or static furnace. Air flows and extraction rates should be optimized to ensure that oxidizing conditions exist within the muffle, and that no exhaust gases enter the room.
Full information on requirements for firing is contained in DuPont Technical Guide EUT 7.4 "Process Guide - Firing". Refer to table - "Processing Conditions"

## Thinner

ALN compositions are optimized for their intended application and do not normally require thinning. Use the DuPont recommended thinner for slight adjustments to viscosity or to replace evaporation losses. The use of too much thinner or the use of a non-recommended thinner may affect the rheological behaviour of the material and its printing characteristics. Refer to table - "Composition Properties"

## Storage and Shelf Life

Containers may be stored in a clean, stable environment at room temperature (between 5°C - 30°C), with their lids tightly sealed. Storage in high temperature (>30°C) or in freezers (temperature < 0°C) is NOT recommended as this could cause irreversible changes in the material.

The shelf life of compositions in factory-sealed (unopened) containers, stored under room-temperature (between 5°C - 30°C) conditions is 6 months from date of shipment. For guidance regarding storage of material, please consult DuPont Technical Note EUT 7.2 "Shelf Life Policy".

## General

Performance will depend to a large degree on care exercised in screen printing. Scrupulous care should be taken to keep the composition, printing screens and other tools free of metal contamination. Dust, lint and other particulate matter may also contribute to poor yields.

## Health/Safety considerations

DuPont thick film compositions are intended for use in an industrial environment by trained personnel. All appropriate health / safety regulations regarding storage, handling and processing of such materials should be complied with. For information on health / safety regulations please refer to the specific product MSDS and to the DuPont Safety Guide EUT 7.1 "Practical Safe Handling of Thick Film Compositions".