**TECHNICAL INFORMATION**

**Crosslinking agent for aqueous carboxylated polymers**

**Composition:** A complexed zinc oxide solution and water

**Appearance:** Liquid

**Colour:** Colorless

**Typical Properties:**
- Non-volatiles: approx. 25.0%
- Density at 20 °C: approx. 10.1 lbs/gal

*This information is intended as a guideline only and should not be used to issue specifications. Slight deviations do not affect application and capability of the product. For specifications please consult the Certificate of Analysis.*

**Properties/applications:**

ZINPLEX 15 contains 13.2% zinc metal ions that can be used to crosslink aqueous carboxylated polymers. This crosslinking or complexing takes place as the coating dries at either room temperature or under forced dry or higher baking conditions.

ZINPLEX 15 is designed to impart and improve:
- Non-blocking characteristics
- Heat & chemical resistance
- Hardness
- Water and solvent resistance
- Detergent resistance
- Mar and scuff resistance

**Main applications:**
- Floor polishes
- Overprint coatings for paper and paperboard
- Clear and pigmented industrial finishes
- Printing inks
- Adhesives
- Aqueous wood lacquers
- Architectural coatings

**Recommended levels/use:**

The properties of a crosslinking agent are greatly dependent upon our customer’s formulations and, consequently, should always be tested (possibly at different treatment levels, temperatures, and/or time intervals) to verify performance prior to use. With certain polymer systems, pre-stabilization may be necessary prior to the addition of ZINPLEX 15. Nonionic surfactants such as METOLAT 388 or high HLB ethoxylated surfactants (e.g., TRITON X405) offer good stabilizing properties.

For further information on formulation guidelines and stabilization procedures, please refer to page 2.

**Storage/handling:**

Mix product and retest for quality after one year from the date of manufacture.

The minimum shelf life in closed containers is 12 months from the date of manufacture. Refer to the Safety Data Sheet for additional handling information.
Formulation Guidelines:

1. The ZINPLEX 15 can be added directly to the resin solution and will remain stable over long periods of time without any increase in viscosity or gelation. This coating solution should have a minimum pH of 8.5 to prevent any of the zinc from precipitating out of solution. Additionally, ZINPLEX 15 can be diluted to 50% with water prior to addition to the resin solution for ease of incorporation. The addition should be added slowly into the vortex of the resin solution with good agitation.

2. Prestabilization of Polymer System Before Addition of ZINPLEX 15: If the resin solution or formulation is unstable when the ZINPLEX 15 is added, it may be necessary to prestabilize the polymer system prior to the addition of the ZINPLEX 15. High ethylene oxide nonionic surfactants such as Triton X405 and Igepal Co-850 or CO-890 offer good stabilizing properties.

If you know the acid value of the aqueous polymers that you are using, you can determine the amount of ZINPLEX 15 to add to crosslink the -COOH groups on the polymer. The theoretical amount (in grams) of ZINPLEX 15 required can be calculated using the following equation: (acid value of the polymer in mg KOH/g) X (% polymer solids) X (weight of polymer in grams) X (0.0049). Usually, only 30% to 50% of the acid groups need to be crosslinked to obtain the desired improvement in properties, so the amount of ZINPLEX 15 should be adjusted accordingly. For every gram of acrylic acid in the polymer, you need 1.14 grams of ZINPLEX 15 to crosslink 30% of the acid groups. 1.91 grams of ZINPLEX 15 will crosslink 50% of the acid groups in 1 gram of acrylic acid.

There may be times when you want to double or triple the amount of ZINPLEX 15 recommended above in order to maximize the hardness or block resistance, although there will be some compromise in reduced flexibility and gloss. If you do not know the acid number of the aqueous polymer or the type of acid used, you will have to determine the amount of ZINPLEX 15 to be added empirically. This can be done by running a ladder study by adding, for example, 2%, 4%, 6%, 8%, and 10% ZINPLEX 15 to the aqueous polymer or coating and checking the resultant properties. In general, the carboxylate polymers contain from 1% to 5% acid by weight, so this ladder should give you a good indication of the level of the ZINPLEX 15 needed to achieve the improvement in properties that are required.

Additions and Stabilization Recommendations:

1. All polymer systems should be adjusted to a minimum pH of 8.5 prior to the addition of ZINPLEX 15.
2. Add ZINPLEX 15 to the polymer system very slowly with good agitation to minimize the formation of small gel particles. If such particles do form, they will dissolve if mixing is continued.
3. When gelling is severe, the polymer systems require pre-stabilization prior to the addition of ZINPLEX 15

Triton X405 is an approximately 40-mole ethoxylate of octylphenol. Any nonionic surfactant of similar composition, such as Igepal CO-850 or CO-890 (nonylphenol ethoxylates), would be an acceptable stabilizing agent.

4. The amount of ZINPLEX 15 to be added to effectively crosslink a polymer system without causing stability problems will have to be determined empirically (i.e., through a series of experiments). Typically, the manufacturers of such polymers do not disclose either the amount or type of acid contained in their polymers.

Our starting recommendation is 1.14 grams of ZINPLEX 15 for each gram of acrylic acid. ZINPLEX 15 contains about 29.3% of a zinc complexing agent having a functionality of 2 and a molecular weight of 161.38. Approximately 1.14 grams of ZINPLEX 15 will crosslink 30% of 1 gram of acrylic acid having a functionality of 1 and a molecular weight of 72.06. Using the same basis, 1.91 grams of ZINPLEX 15 will crosslink 50% of 1 gram of acrylic acid.