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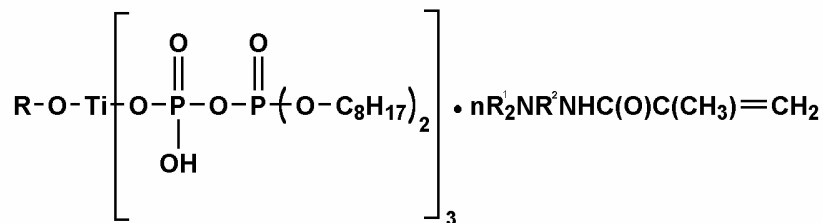
## PRODUCT DATA SHEET

### BIOchem<sup>®</sup> C-3 PD65

**COMPOSITION OF BLEND:**      BIOchem C-3 = 65%      (CAS # 117002-37-6)  
    Silicon Dioxide = 35%      (CAS # 112926-00-8)

**CHEMICAL DESCRIPTION:**      neopentyl(diallyl)oxy, tri(dioctyl)pyrophosphato  
 (CAS # 117002-37-6)      titanate (adduct) N-substituted methacrylamide or  
    (Titanium IV 2,2 (bis 2-propenolatomethyl)butanolato, tris (dioctyl)  
    pyrophosphato-O (adduct) 3 moles N, N-dimethylamino-alkyl  
 propenoamide) or Titanate (3-), [P,P-bis(2-ethylhexyl) diphosphato (2-)-κO''']bis[P,P-bis(2-ethylhexyl) diphosphato (2-)-κO'', κO'''''] [2,2-bis[(2-propenyloxy) methyl]-1-butanolato- κO]-, trihydrogen compound with N-[3-(dimethylamino) propyl] -2-methyl -2-propenamido (1:3)

#### CHEMICAL STRUCTURE:



**TITANATE TYPE:**      Neoalkoxy

#### TYPICAL PROPERTIES OF LIQUID PORTION:

<i>Physical Form</i>	<b>Liquid</b>
<i>Solids (in IPA Solvent), %</i>	<b>99+</b>
<i>Color – Descriptive Gardner</i>	<b>Reddish Brown 18</b>
<i>Viscosity, cps @ 25°C (77°F)</i>	<b>2,000 – 8,000</b>
<i>Specific Gravity @ 16°C (60°F)</i>	<b>1.05± 0.04</b>
<i>Flash Point, °F (TCC)</i>	<b>160</b>
<i>Initial Boiling Point, °F, ASTM</i>	<b>220</b>
<i>pH (saturated solution)</i>	<b>7.5 – 9.5</b>

*Solubility*      Soluble in Water and IPA. Limited (1 to 5%) solubility in Xylene. Limited solubility in Toluene and DOP. Insoluble (<1%) in Mineral Oil.

#### PROPERTIES OF SILICON DIOXIDE:

Particle Size = 6.0 micrometer  
 pH (5.0%) = 7.0  
 Oil Absorption = 190 (cc/100g)  
 Surface Area = 140 (m<sup>2</sup>/g)

#### PROPERTIES OF BIOchem C-3 PD65:

Physical Form = Powder  
 Color = Off White  
 Specific Grav. = 1.28  
 Dispersion = Free flowing powder, no foreign matter.

**BIOchem C-3 PD65** is a 65% active powder, that under anaerobic landfill conditions of warmth, moisture, darkness and little or no oxygen, enables anaerobic microbes to consume the polymer and organic additives as described in US 7,390,841. In the process, the microbes convert the composition to biomass, methane, CO<sub>2</sub> – and to soluble chloride salts, when halogenated polymers, such as PVC are being consumed. Under aerobic conditions of oxygen and light, the BIOchem additives will not affect durability and will function as beneficial titanate coupling agents, aiding dispersion and processability.

**Applicable Polymers** – BIOchem C-3 PD65 has been shown to work in PVC, CPE and PVC copolymers, with no evidence of chlorine-containing compounds released into the gas phase. The conversion of chlorine content to soluble chloride has been shown to improve the fertilizer value of the solid phase. Efficacy has been also demonstrated with styrenics and polyolefins. Work is ongoing. BIOchem is not effective in PET.

**Use Level** – Generally, 1.5 phr (parts per hundred of resin) BIOchem C-3 PD65 will enable landfill biodegradation of a thin sheet of plastic in a few weeks. With heavy gauge parts, 3 phr is suggested. The more surface area to the plastic part, the shorter the time to biodegradation.

**Biocides Inhibit BIOchem** - Since BIOchem functions by enabling microbes to consume plastics, biocides will inhibit effectiveness. For example, zinc-based stabilizers inhibit landfill biodegradation because they are known biocides. BIOtech can provide suggestions as to heat stabilizers appropriate for specific applications.

Phthalocyanine pigments inhibit landfill biodegradation and should be avoided. BIOtech can provide suggestions for replacements. In polyolefins, color forming antioxidants, such as BHT and Bisphenol, should be avoided in favor of high efficiency stabilizers, such as Irganox® 1010.

**Product Forms** – BIOchem C-3 comes in three forms: BIOchem C-3 LD100 (LiquiD-100% active); BIOchem C-3 PD65 (PowDer-65% active); & BIOchem C-3 PT20 (PelleT-20% active).

**Processing Considerations** – BIOchem C-3 PD65 should be dispersed uniformly throughout the polymer matrix by blending with other powder compound ingredients or feeding gravimetrically. Since BIOchem C-3 PD65 has the favorable effect of increasing polymer flow while not diminishing mechanic properties, it is

necessary to reduce process temperatures ~6% to maintain reactive compounding shear. Using torque as a guide: compound, extrude or mold to equivalent Work Energy (the Area under the Torque vs. Time Curve). In PVC, lubrication packages and plasticizer levels (up to 18%) may have to be reduced. Also, since its IBP is 220°F (104°C), BIOchem C-3 PD65 must not come in contact in the neat state with metal heated above 220°F (104°C) until the BIOchem is dispersed into the heat sink of the polymer. Extruder hoppers should be at room temperature and there should be one to three transition zones below the IBP before heats are set at ~6% lower than normal.