



Technical Bulletin

EZENTUS™ Pigments

***Ezentus* Pigments from DayGlo are a new class of formaldehyde-free, high performance fluorescent pigment.**

Maintaining function and value may be the most challenging aspect of designing safe, non-toxic products. Ezentus, DayGlo's newest fluorescent pigments have met this challenge in a safe and responsible way. Relying on innovative materials and on pioneering new manufacturing processes, Ezentus pigments are about connecting "what's needed" with "what's possible". User-friendly materials that eliminate chemicals of concern and make no compromises in performance or value. When compared to the class-leading formaldehyde containing pigments, Ezentus pigments distinct advantages include:

- **Formaldehyde Free**
- **Improved Thermal Stability**
- **Migration Free**
- **Improved lightfastness**

Ezentus is the future of fluorescent color....

Available Colors

Aurora Pink®	EZ-11
Blaze Orange™	EZ-15
Saturn Yellow®	EZ-17
Signal Green™	EZ-18
Corona Magenta™	EZ-21

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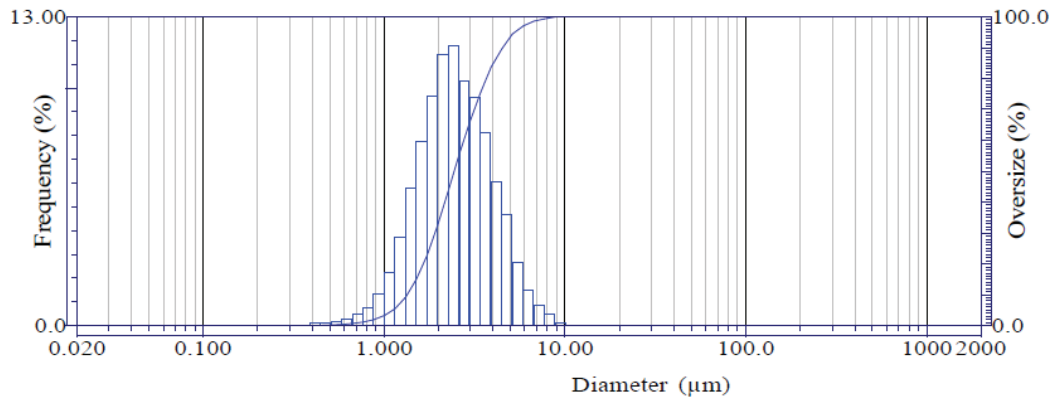
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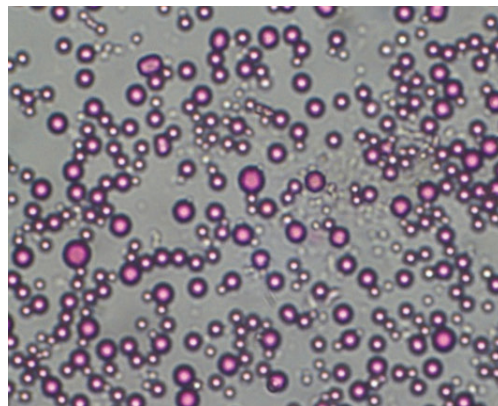
Typical Properties

Oil Absorption	54g oil / 100g pigment
Weight per Gallon	10.42 lbs /gal
Density	1.25 g/ml
Bulk Density	20.0 lbs /ft ³
Moisture Content	< 2.0%
Particle Shape	Spherical
Mean Particle Size	2.5 μm
T _g	150°C
Heat Stability	250°C
Lightfastness	2-3 BWS

Typical Particle Size Distribution



Particle Morphology



EZ-21 1000 Magnification

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Solvent Compatibility

	EZ-17	EZ-15	EZ-11	EZ-21
Alcohols				
Methanol	2.5	2	2	2
Ethanol	3	2.5	3	3
Propanol	3	3	4.5	4
n-Butanol	2.5	3	4	4
Diacetone Alcohol	3	2.5	2.5	2.5
Ketones				
Acetone	3	3	3	4
MIBK	3.5	2.5	3.5	4.5
MEK	3	3	3.5	4.5
Cyclohexanone	3	3	3	4.5
Esters				
Ethyl Acetate	4.5	4.5	4.5	4.5
Diethylene Glycol Monobutyl Ether Acetate	4.5	5	5	5
Isopropyl Acetate	5	5	5	5
Isobutyl Isobutyrate	5	5	5	5
Butyl Acetate	5	5	5	5
EB Acetate	5	5	5	5
Glycols & Glycol Ethers				
PEG 400	3.5	4	3.5	3.5
Propylene Glycol	3.5	4	3.5	3.5
Propylene Glycol Monomethyl Ether	3.5	4	3.5	3.5
Tripropylene Glycol Monomethyl Ether	4	4	4	4.5
Aromatics				
Toluene	5	5	5	5
Xylene	5	5	5	5
Aliphatics				
Mineral Spirits	5	5	5	5
Lactol Spirits	5	5	5	5
VM&P Naphtha	5	5	5	5
Plasticizers				
Santicizer 141 ¹	4.5	4.5	4.5	5
Eastman 168 ²	5	5	5	5
Hexamoll ³	5	5	5	5
Diocyladipate	5	5	5	5

1-Ferro, 2-Eastman Chemical, 3-BASF - Test Method: 1 g of pigment mixed with 9 g of solvent. Bleed assessed after 24 hrs. at room temperature. 1= Considerable Bleeding, 5= No Bleeding

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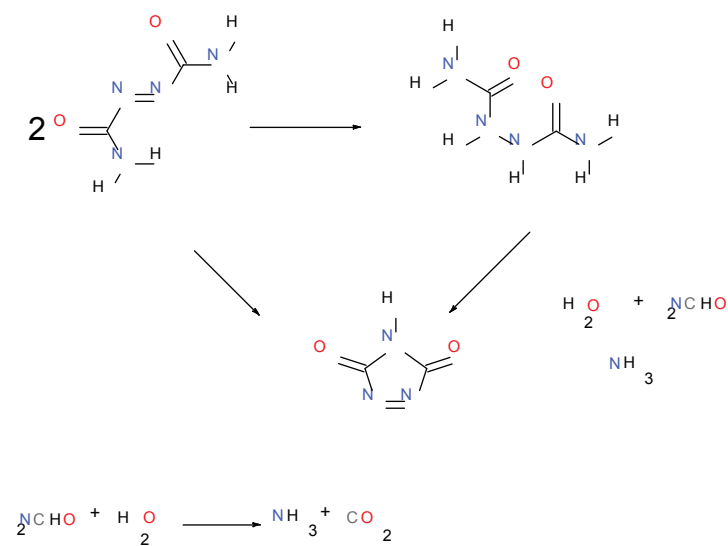


EZ Pigments in Polyolefin and EVA Foams

Expanded polyolefins and EVA foams are being used increasingly in sports shoes and apparel because these closed cell foams are stable, durable and chemically resistant. The primary blowing agent used to produce polyolefin and EVA foams is azodicarbonamide, typically combined with zinc oxide, zinc stearate, stearic acid and reactive peroxides. Formulations of this type produce crosslinked foams that are more stable than similar highly expanded un-crosslinked foams. This crosslinked structure creates a foam that can keep its structure at temperatures approaching the melting point of the base polymer, and in some cases exceed it. One of the added benefits of parts made from polyolefin and EVA foam is the ability to create parts by compression molding methods, including the injection molded foam process.

EZ Pigments now give processors of polyolefin and EVA foams the ability to produce formaldehyde-free bright fluorescent colors. The mechanisms proposed for decomposition of azodicarbonamide vary, but in all cases one of the gaseous products of decomposition is ammonia. In order to produce the best quality colors using EZ Pigments, it is necessary to

neutralize the ammonia. Carbopol 940 Polymer¹ and malic acid have both been effective in buffering evolved ammonia, however malic acid has given the best performance.



Reaction Scheme for Decomposition of Azodicarbonamide

effective at crosslinking the foams while not being detrimental to color like other peroxides such as dicumyl peroxide. Other peroxide should be tested for suitability.

¹ The Lubrizol Corporation

² CelChem LLC

³ Arkema

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Recommended Foamed EVA Formulas

Ingredient	Amount
EVA	79.4
4,4'-oxybis (benzenesulfonylhydrazide)	8.0
Calcium carbonate	8.0
Calcium stearate	2.6
EZ Pigment	1.5
2,5-Bis(tert-butylperoxy)-2,5-dimethylhexane	0.5

Formulation using Di-tert-butyl peroxide and AZO

Ingredient	Amount
EVA	71.3
Calcium carbonate	20.0
Polyethylene wax	2.0
Zinc stearate	1.0
Di-tert-butyl peroxide	1.8
Azodicarbonamide	2.0
Malic acid	0.9
EZ Pigment	1.0

Formulation using zinc oxide/stearic acid & AZO

Ingredient	Amount
EVA	70.2
Calcium carbonate	20.0
Polyethylene wax	2.0
Zinc oxide	0.8
Stearic acid	1.8
Di-cumyl peroxide	1.3
Azodicarbonamide	2.0
Malic acid	0.9
EZ Pigment	1.0

EZ Pigment in Flexible PVC

Over the past few decades Polyvinyl Chloride (PVC), commonly known as "vinyl," has become one of the most widely-used types of plastics. We find it all around us in packaging, home furnishings, children's toys, automobile parts, building materials, hospital supplies, and hundreds of other products. Its advantages are that it is highly versatile and relatively inexpensive. Recently PVC recipes are evolving to take into account legislation against the use of heavy metal stabilizers, trends in flame retardants and the controversies over the use of phthalate plasticizers. Formaldehyde, associated with fluorescent pigments can be added to this list of undesirable substances. **EZ Pigments** now give the vinyl compounder a migration-free alternative to traditional fluorescent pigments without the added formaldehyde.

Recommended PVC Formulations

Non-Phthalate Flexible PVC Compound using Ba/Zn metal Stabilizer

Ingredient	Amount	Supplier
PVC Resin 155	71.0	Oxy Vinyl LP
Triisooctyl Trimellitate	20.0	Exxon
Mark 6055 Ba/Zn Stabilizer	5.0	Galata Chemicals
Paraplex G-62 (ESO)	2.5	Hall Star
AC-395A Wax	0.5	Honeywell
EZ Pigment	1.0	DayGlo

Non-phthalate Flexible PVC Compound, Barium/Zinc Free

Ingredient	Amount	Supplier
PVC Resin 155	64.2	Oxy Vinyl LP
Eastman 168	30.0	Eastman Chemical
Hydrotalcite FG	1.7	Akro Chem
Paraplex G-62 (ESO)	2.6	Hall Star
AC-395A Wax	0.5	Honeywell
EZ Pigment	1.0	DayGlo

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