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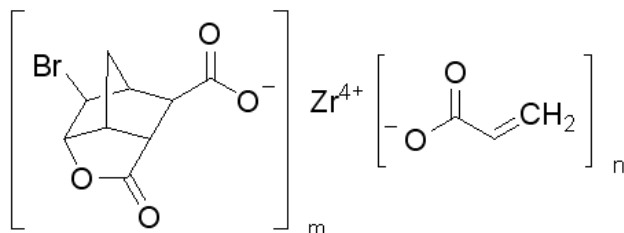
Technical Bulletin

Zirconium bromonorborenelactone carboxylate triacrylate

Catalog Number **686204**
Store at Room Temperature
Technical Bulletin AL-238

Synonym: PRM30

Product Description



m ~1

n ~3

Zirconium bromonorborenelactone carboxylate triacrylate (PRM30) is a zirconium-containing multifunctional acrylate useful for producing cured, transparent films with high refractive indices. It can be used alone or blended (formulated) with other metal-containing acrylates:

zirconium acrylate (Cat. No. 686239)
hafnium acrylate (Cat. No. 686212)
zirconium carboxyethyl acrylate (Cat. No. 686247)
hafnium carboxyethyl acrylate (Cat. No. 686220)

PRM30 and PRM30/metal acrylate blends can be used in combination with other cross-linkable, film-forming macromers such as diurethane dimethacrylate (Cat. No. 436909) and dipentaerythritol penta-/hexa-acrylate (Cat. No. 407283). Recommended amount of PRM30 to be used in these formulations is 50–100 weight % (excluding solvent).

Film-forming formulations employing PRM30 can be prepared in a number of organic solvents, including:

2-butanone (Cat. No. 676926)
ethyl acetate (Cat. No. 676810)
tetrahydrofuran (Cat. No. 676764)
1-propanol (Cat. No. 402893)

Recommended total solid content in these formulations is between 10–20 weight %. A combination of 2-butanone and 1-propanol solvents is preferred for improved shelf life stability of the formulations.

Films prepared from the above formulations can be cross-linked using a UV-radiation initiator, e.g., 1-hydroxycyclohexyl phenyl ketone (Cat. No. 405612) or using heat-sensitive initiators, such as benzoyl peroxide (Cat. No. 179981) and 2,2'-azobis (2-methylpropionitrile) (Cat. No. 441090).

Precautions and Disclaimer

This product is for R&D use only, not for drug, household, or other uses. Please consult the Material Safety Data Sheet for information regarding hazards and safe handling practices.

Storage/Stability

Store the product at room temperature.

Procedure

Preparation of a high refractive index film on PET substrate, e.g., Toray Lumirror®

1. Add 28.3 g of 2-butanone to an amber bottle and stir vigorously with a stir bar. Slowly add a total of 5.0 g of PRM30 in four roughly equal portions, waiting two minutes between the portions to allow the solid to dissolve.
2. In a second amber bottle, dissolve 5.0 g of dipentaerythritol penta-/hexa-acrylate (Cat. No. 407283) in 3.3 g of 2-butanone.
3. In a third amber bottle, mix 0.2 g of 1-hydroxycyclohexyl phenyl ketone (Cat. No. 405612), 4.2 g of 2-butanone, and 5.6 g of 1-propanol. Add 13.3 g of the PRM30/2-butanone solution (step 1) to the mixture. Mix by stirring until homogeneous. Add 3.3 g of the dipentaerythritol penta-/hexa-acrylate/2-butanone solution (step 2) to the mixture. Mix by stirring until homogeneous.
4. Filter solution through an Acrodisc® CR, 1.0 µm PTFE syringe filter (25 mm diameter, Cat. No. Z259926).

5. Coat a Lumirror T PET film from Toray (75 μm thick) with the solution prepared in step 4 using a wire-wound coater (3 mil diameter, e.g., Cat. No. AR-4103 from BYK-Gardner) to a wet film thickness of $\sim 5 \mu\text{m}$.
6. Dry the film for 60 seconds at 80 $^{\circ}\text{C}$ in an oven.
7. Cure the dried film using a Blak-Ray[®] UV lamp (Model 100 AP) for 15 minutes. The cured film can be tested to determine scratch resistance, hardness, chemical resistance, and refractive index.

Results

Films containing PRM30 show higher refractive indices compared to films with similar composition containing dipentaerythritol penta-/hexa-acrylate or zirconium acrylate (see Table 1).

Table 1.

Representative Properties of Zirconium Acrylate Films

Film Components	Cures	Scratch ¹	PH ²	n^3
PRM30	Yes	2	2	1.63
PRM30 and dipentaerythritol penta-/hexa-acrylate (1:1)	Yes	3	4H	1.57
zirconium acrylate and dipentaerythritol penta-/hexa-acrylate (1:1)	Yes	3	4H	1.54
dipentaerythritol penta-/hexa-acrylate	Yes	3	4H	1.51

1. Scratch is relative scratch resistance of the film and is measured by scratching the coated PET film with fine steel wool (Grade #0000) four times with a load of 400 g. The naked eye observed range of scratch resistance is from 3 to 1 where 3 is excellent (no scratches at 400 g load).
2. PH is Pencil Hardness of the film and is measured by pencils of different hardness starting with 4H and decreasing in hardness to 6B until the pencil does not mark the film as determined by naked eye inspection.
3. n , refractive index, is measured by using a Bausch and Lomb Abbe Refractometer Model ABBE-3L at 25 $^{\circ}\text{C}$ using 1-bromonaphthalene (Cat. No. B73104) as the contact liquid.

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Acrodisc is a registered trademark of Gelman Sciences Inc.

Blak-Ray is a registered trademark of Ultra-Violet Products, Inc.

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