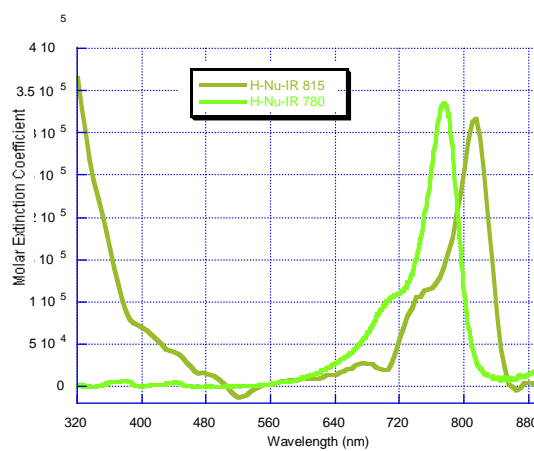
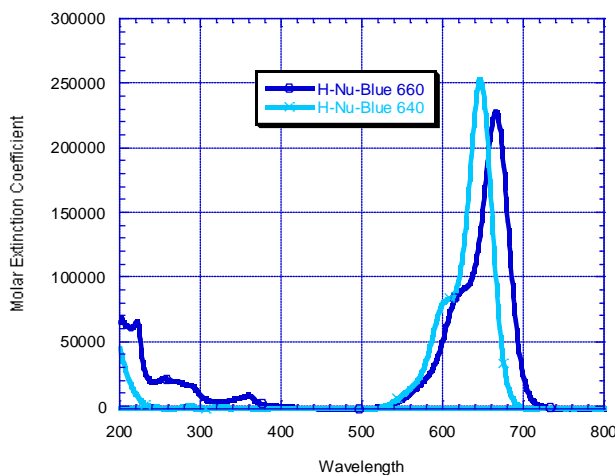


H-Nu Blue 640, 660 Visible Light Photoinitiators H-Nu-IR 780, 815 Infrared Light Photoinitiators

General Information

- The **H-Nu Blue and IR Series** of cyanine borate photoinitiators, namely **H-Nu Blue 640 and 660** as well as **H-Nu IR 780 and 815** absorb in the visible to infrared spectrum (550-850 nm).
- **H-Nu Blue and IR series photoinitiators** are capable of curing a wide range of acrylate resins via a free-radical mechanism



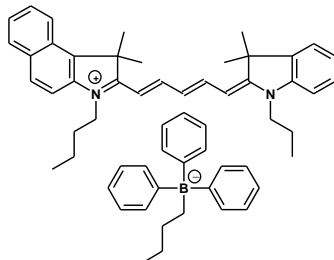
Initiator	Color	Abs Peak	ϵ at peak	Abs Range
H-Nu-Blue 640	Blue	645	255,000	570-670
H-Nu-Blue 660	Blue	665	230,000	580-690
H-Nu-IR 780	Blue-Green	780	>250,000	650-810
H-Nu-IR 815	Blue-Green	815	>250,000	690-850

Benefits of Use

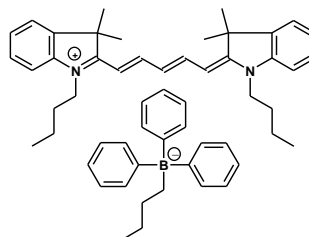
- Absorbance in the 550-830 nm range for curing with red and infrared light sources including red handheld lasers and laser diodes
- Good solubility in a variety of monomers
- Capable of curing a wide range of acrylates via a free-radical mechanism
- Cure through colored substrates (e.g. a red taillight assembly)
- Initiator bleaching: pale or no residual color (Borate V enhances cure and bleaching)
- Bleaching/Color change indicator of exposure/cure with Visible/Infrared light

H-Nu-Blue Structures

H-Nu-Blue 660

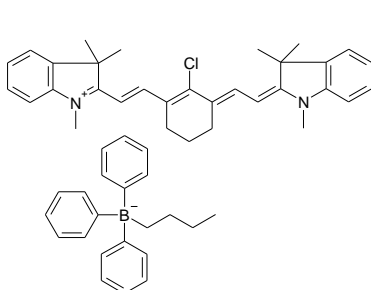


H-Nu-Blue 640

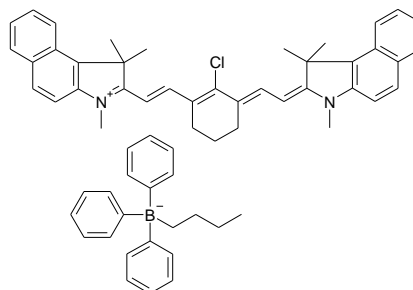


H-Nu-IR Structures

H-Nu-IR 780



H-Nu-IR 815



Photoinitiator Usage Recommendations

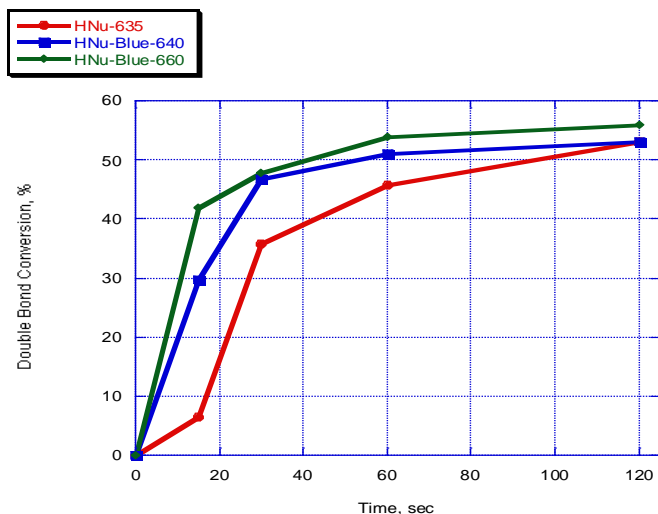
- The recommended starting level of **H-Nu-Blue/IR initiators** ranges from 0.25 - 1 wt.% in relation to the total amount of resin in a formulation.
- **Borate V** co-initiator at a 1:1 weight ratio is not required but significantly increases the cure speed and overall bleaching of the initiator, so it is highly recommended.
- The **H-Nu Blue/IR initiators** are quite soluble in most acrylate resins, but we recommend predissolving them and the **Borate V** (poor solubility in acrylates) in **DMAA (N,N-Dimethylacrylamide)** for ease of incorporation into your formulation.
- Recommended starting concentrations:

0.50 wt.% H-Nu Blue/IR 640, 660, 780 & 815	0.5 wt.% Borate V	2-3% DMAA
---	--------------------------	------------------

Optimization may be necessary

Curing Activity of H-Nu-Blue series of Photoinitiators

H-Nu-Blue 640 and 660 were compared as free radical initiators with SGL's H-Nu 635. The experiment was carried out with a Xenon RC500 Visible light source coupled with a red cutoff filter that eliminated radiation below 590 nm. A peak at 810 cm^{-1} was monitored with FTIR to calculate acrylate double bond conversion.



Model Formulations Tested:

30 parts Sartomer CN966H90
30 parts Sartomer SR306
20 parts Sartomer SR399
20 parts Sartomer SR351
0.2 parts H-Nu 635
0.2 parts Borate V

30 parts Sartomer CN966H90
30 parts Sartomer SR306
20 parts Sartomer SR399
20 parts Sartomer SR351
0.1 parts H-Nu-Blue 640

30 parts Sartomer CN966H90
30 parts Sartomer SR306
20 parts Sartomer SR399
20 parts Sartomer SR351
0.1 parts H-Nu-Blue 660

H-Nu 635, H-Nu-Blue 640, H-Nu-Blue 660, and Borate V are available from Spectra Group Ltd

Curing Activity of H-Nu-IR series of Photoinitiators

H-Nu-IR 780 and 815 are free radical initiators. Their curing activity is highly dependent on the nature of the light source, its intensity and wavelength, as well as reactivity of the formulation. Certain coinitiators such as Borate V will increase speed of free radical cure. Customers are recommended to evaluate activity of H-Nu-IR 780 and 815 in their own setting. H-Nu-IR 780 and 815 were tested at 0.1% in TMPTA and found to cure using only light above 700 nm from a broadband halogen lamp light source. The samples were cured between glass slides and formed a solid film. H-Nu-IR 780 exhibited faster curing speed than H-Nu-IR 815.