

# Archival Grade DVD-R

White Paper

Recordable Digital Versatile Disk media markets are growing rapidly all over the world. The media is used for a wide variety of purposes and has become a commodity product much like Recordable Compact Disc media previously did. Many people assume that the quality of a Recordable DVD does not vary from one manufacturer or brand to another, however this is not so.

Most professional users require Recordable DVDs of the highest quality, offering greater reliability in storing and protecting critical data. Consumers hope to store precious memories to Recordable DVD with the knowledge that the content will be accessible for many years to come.

In response to concerns and anxiety regarding disc longevity, Dual Reflective Layer Technology has been developed by Verbatim and its parent company, Mitsubishi Kagaku Media (MKM), the world leader of Recordable DVD media in sales, manufacturing and R&D.

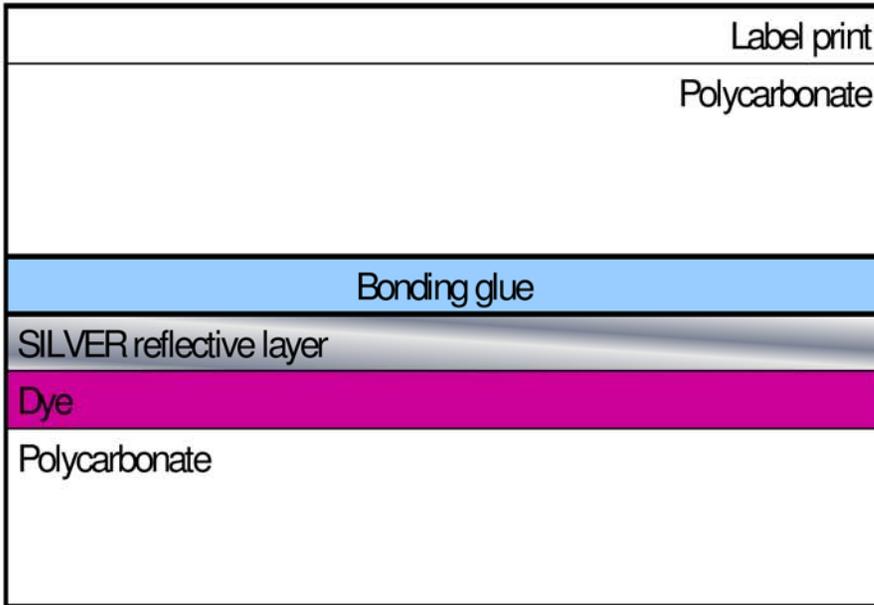
The discs featuring this technology are brought to market as Verbatim Archival Grade DVD-R.

Compared with a conventional DVD-R disc, the main difference is within the reflective layer, responsible for reflecting the recording or playback laser beam from the DVD writer or player. Normally a DVD-R disc is manufactured as follows: disc label, 0.6mm dummy substrate, bonding glue, metal reflective layer, recording dye layer on another polycarbonate substrate, which is also 0.6mm thick.

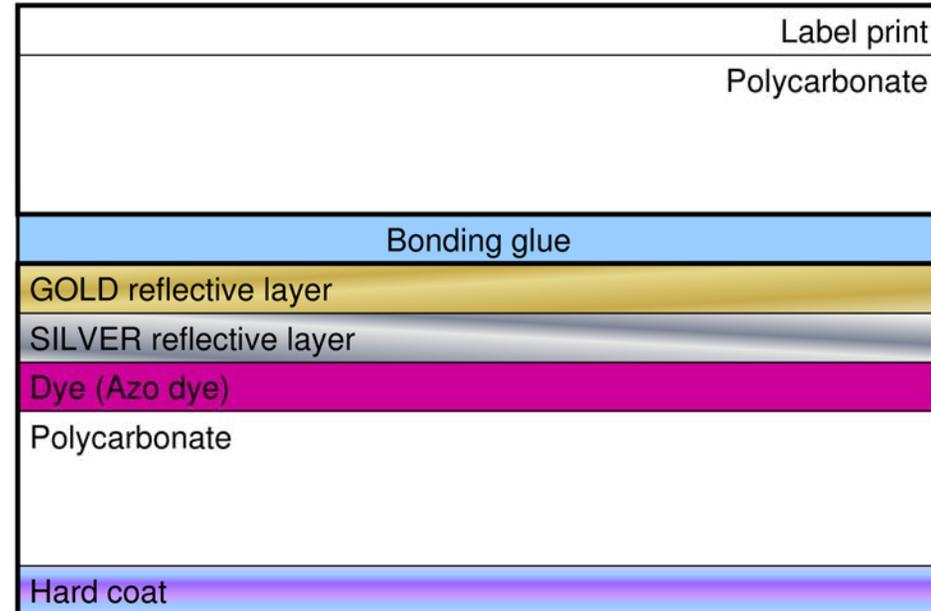
The Dual Reflective Layer Technology means literally two metal layers are processed in the reflective layer that usually consists of a single metal. This unique layer is made of both gold and silver. More importantly each material is separately positioned with a crucially different function. The lower layer is made of silver and the upper layer is made of gold. Normally only silver is used for the reflective layer material, while a few DVD-R products utilise gold for the layer.

To provide the most complete protection possible, Verbatim and MKM have included one more substantial material in their Archival product, a Hard Coat, on the data side of DVD-R disc.

# Product Structure



Standard R-DVD disc



MKM's Dual Reflective Layer R-DVD disc

## Excellent environmental durability of Gold reflective layer

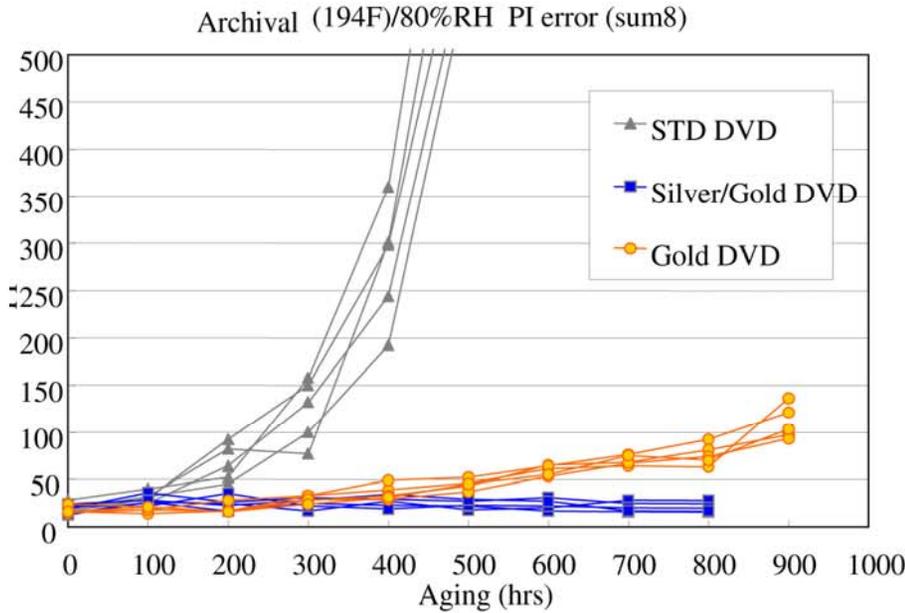
Gold is more durable than silver against atmospheric substances such as oxygen. Oxidisation is one of the primary causes of corrosion and the same is true for all optical discs including CD and DVD media.

In some DVD-R media products, oxygen can penetrate through the bonding glue exposing the metallic reflective layer to the danger of corrosion. The gold layer prevents this integral element from deterioration far better than silver alone.

Tested under a full range of environmental and accelerating aging conditions, Verbatim's Archival Grade DVD-R media performed flawlessly when subjected to extreme heat, humidity and ultraviolet light. Estimated lifetime tests show that this revolutionary Archival Grade media lasts longer than premium grade recordable DVD discs available today.

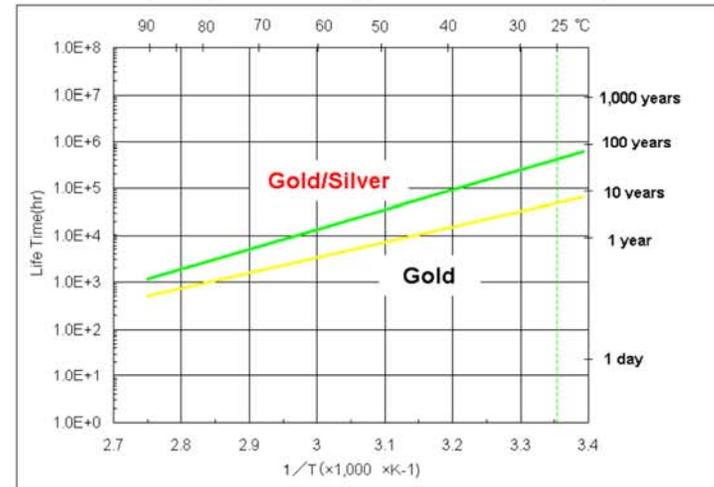
As illustrated in the following chart, "gold layer only" disc shows inferior performance to the dual layer one. Gold itself is chemically stable but remains relatively soft when used in DVD media. This can lead to deformation of other adjacent materials such as dye and polycarbonate, which are heated easily.

# Features: Lifetime



Damp Heat Test  
Comparison various media

Arrhenius plot (Gold vs. Hybrid "Gold/Silver")



Life Time Estimation  
Comparison gold/silver  
reflection layers

# Features: Dye

The “Advanced Azo” Technology, patented by MKM, is another factor that contributes to the extended archival life of this DVD-R media.

Advanced Azo dye is used in the recording layers of all Verbatim DVD+/-R media. Proven for more than a decade, MKM has utilised their Azo dye technology across their range of optical media, in response to the demand for high quality and reliable media from a broad range of users.

The most striking advantage of Azo dye is durability against heat, UV light, and repeated writing or playback laser power in comparison to other dye solutions.

Almost all current DVD-R discs use silver for their reflective layer. DVD drive manufacturers develop writing strategies, namely, laser power control for precise data recording, optimised for compatibility with a broad range of media brands. Knowing that each metal or alloy indicates a different optical characteristic (or heat conductivity) in reflectivity of the laser, the drive manufacturers usually tune the writing power to silver. In other words, the silver reflective layer looks standard to the majority of current DVD drives available on the market. The gold one, on the other hand, doesn't look standard to those drives. This little deviation makes "signal to noise ratio" unnecessarily low when recording, which can result in poor quality recording. For accurate data recording and reading of a gold-only layer disc, firmware upgrade of the drive would be required.

Advanced Azo Technology was designed to optimise the essential chemical reaction where DVD drive makes pits of "0"s and "1"s through the laser. If the dye doesn't react finely, precise data pits will not be created.

Purity of dye is the other key component of the DVD media when DVD drive manufacturers develop a new burner and decide writing strategy.

# Features: Drive Compatibility

drive		MKM Silvber/Gold 8x-R	Competitor A's Gold 4x-R	Competitor A's Gold 8x-R
Pioneer	DVR-105	4x	4x	
	DVR-107	8x	4x	8x
	DVR-108	12x	4x	8x
	DVR-109	8x	4x	8x
	DVR-110	8x	4x	8x
Plextor	PX-712A	8x	4x	8x
	PX-716A	8x	4x	8x
SONY	DRU-530A	8x	4x	4x
Benq	DW-822A	4x	4x	8x
	DW-1620	12x	4x	8x
	DW-1640	8x	4x	12x
HLDS	GSA-4082B	8x	4x	
	GSA-4163B	8x	4x	8x
NEC	ND-2510A	8x	4x	8x
	ND-3520A	12x	4x	

 P1sum8 max : more than 280

Drive compatibility test  
using various writers frequently used in archival systems

# Features: Hard Coat

For enhanced data protection, a hard coat is applied to the data side of the DVD-R disc. While the upper surface of DVD-R disc is just part of dummy substrate, the lower surface is where the laser passes to write or read digital data. When scratches or abrasion occur on this surface, transmission of the laser light through the surface can be disrupted. In spite of the usual care of users, damage can often occur during disc handling. The critical digital information can thus become corrupted much faster if the reflective layer or recording layer is scratched or damaged.

Verbatim's patented hard coat, called "Scratch Guard", is forty times more resistant against scratches than non-hard coated media.



Many professional users (will) appreciate the benefits of the Dual Reflective Layer Technology that is incorporated into Verbatim's Archival Grade DVD-R media.

Organisations and professionals handling critical information and compliance regulations:

Government data

Legal files

Telecommunications

Audio and video (post production)

Broadcast

Server backup

Weather, geography, military,  
and census records

Finance or banking data

Government security records

Medical images

Content management

Email Archiving

Back file conversion

Others

End users taking care of precious memories:

Home videos

Home security records

Home photos

Others

- 95355: DVD-R 4.7GB Archival Grade 50pk Spindle Hard Coat 8X (Available Now)
- 43638: DVD-R 4.7GB Archival Grade Inkjet Printable 5pk Jewel Case Hard Coat 8X (Available June 2007)



Verbatim has just launched a unique and breakthrough DVD-R media based on Dual Reflective Layer Technology featuring both gold and silver metal layers, replacing the conventional single reflective layer.

The new dual reflective layer demonstrates superior long-term data preservation. The gold layer prevents chemical degradation and corrosion and the silver layer maintains the good read-write compatibility between DVD recorders and players. Verbatim's Hard Coat protection further enhances the product offering.

This product aims to be the most reliable product available to users who wish to record, store and playback important information and data trouble-free today, tomorrow and many years into the future.