

Neue Technologie der Langzeit - Informationsspeicherung

A new technology of long-term information storage

A.A.Kryuchyn, V.V.Petrov, S.M.Shanoylo, I.A.Kosko
Institute for Information Recording, Ukraine
2, Shpak Str., 03113 Kyiv, Ukraine
Tel: (380 44) 456-8389 fax: (380 44) 241-7233
E-mail: petrov@ipri.kiev.ua http:// www.ipri.kiev.ua

Zusammenfassung:

Es wird eine Technologie zur digitalen Langzeit-Speicherung von Dokumenten auf Metallplatten-trägern vorgestellt. Die Dokumente werden in denselben Formaten, die bei der Informations-speicherung auf CDs verwendet werden, aufgezeichnet.

Abstract:

A technology for organizing the long-term storage of documents represented in the digital form on disk metal media is offered. The documents are recorded in the formats used by information recording on CDs.

Till beginning of the 20th century paper was practically the only tool which was used for recording and archiving of information. The appearance of plastics having high operational characteristics caused their wide application in archiving of materials. However many documents on polymeric film media require a special preservation and carrying out additional work on copying materials for their further conservation. One of the most reliable modern polymeric materials for recording media is polycarbonate from which are manufactured CD substrates. It is difficult to give a precise evaluation of storage terms for polycarbonate recording media in the first place because of steadily increasing loads during the information reproduction. It is one of the reasons of slow CD introduction into archiving systems.

Currently are outlined two main directions of work which make available long-term and reliable information storage. Firstly, it is a conversion of archive materials into the digital form and, secondly, it is development of media having a long-duration guaranteed term of information storage, which would exceed the term of storage on the best paper sorts (several centuries). The conversion of archives and library collections into the digital form makes it accessible to a broad circle of researchers, allows to conserve them for next generations. Such a transformation made once with a high resolution allows to manufacture a necessary number of copies and to carry out periodically the transfer of insurance copies by expiration of the guaranteed shelf life for media. The questions arising at such a technology are bound up with a fact that the terms of carrying out a transfer are not determined sufficiently precisely and the loss of even slight fragments of information blocks can cause the loss of a significant information volume. The increasing information volumes which are subject to long-duration storage hinder substantially the periodical transfer of archival documents. It would be desirable to pass in archival documents storage systems to guaranteed storage terms as a minimum 200-300 years, i.e. to terms of information storage on high-quality paper. However, it should be taken into account that a digital copy is only an approach to the original, although a very near one. For information reproduction from certain rarity media such as the Edison wax cylinders, the copper copies of such cylinders, the gramophone records with vertical recording was required the development of special, rather complicated manufacturing equipment. It would be wasteful to develop such an equipment every 50-100 years.

Recently particular attention is given to methods of information recording on metal media which provide a principally higher level of reliable information storage. Such an approach develops the Norsam Technologies which offers to use 3-inch nickel disk (Rosetts Disc) for storing information in analog form [1]. The application of metal media provides reliable storage of documents under conditions of sharp changes in temperature and humidity. The metal media with relief presentation of information manufactured by using modern methods of laser recording and electroforming provide the recording densities of 0.01-0.05 Gbyte/mm². The capacity of a metal medium can be up to 5 Gbyte. The use of promising CD manufacturing technologies will allow to increase the metal media capacity up to 30-50 Gbyte. The possibility of information recording on metal media in analog form is also not ruled out.

The high chemical resistance of nickel media guarantees the conservation of information as a minimum 250-300 years. The analysis of the chemical composition and the profile of copper-nickel stampers which were manufactured 50-70 years ago for replication of gramophone records has shown that on the surface of stampers is absent a solid oxide film, the stampers have mirror reflection in areas without information tracks.

The areas with the elevated content of oxygen are bound up with the presence of local contaminants in the medium material. The use of modern electroforming methods allows to reduce by a factor of 10-100 the quantity of impurities in a metal medium what will favour the increase of its service life. The high reliability of information storage on metal media is achieved not only at the expense of physical and chemical properties of the medium material but also at the expense of a method selected for the information presentation. The information presentation in the form of a relief microstructure (cavities of different length) provides a reliable long-term information storage.

Even in the case of uniform solid oxidation of the metal medium surface which deforms the relief microstructure presenting recorded information the changes causing malfunctions in reading can occur in 300-400 years.

On the metal medium the information is recorded in standards applied for information presentation on CDs and the medium of itself is a disk 120 mm in diameter with a central hole 15-34 mm in diameter fitting into the reading device for CDs. The thickness of a medium is 200-300 μm . The application of special protective layers can increase the service life of an information medium. One of the problems for providing the long-term information storage is the conservation both of the recording media and the devices on which they are reproduced. Therefore for the information presentation on metal media it is expedient to choose the widely used methods of encoding and the metal media to manufacture in the CD format. The reading of information from metal media can be made on the standard CD players after their slight retrofitting (the mounting of an optical compensating plate and the updating of a disk fixing unity).

The cost of information storage on metal media is unconditionally higher than on polymeric materials but the expenses are justified when the question is of reliable conservation for a long period of information which is of a great cultural and scientific value.

References

1. <http://www.norsam.com>