CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
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Project Number
J1933

Project Title
Gone with the Light!

Abstract

Objectives/Goals
Does CD-R optical media degrade in fluorescent light under constant temperature and humidity? Degradation is measured as data loss using commercial, off the shelf, CD optical read/write drives.

CD-Rs are optical media, designed to be affected by the laser light inside of optical drives. Therefore, CD-Rs will degrade under fluorescent light. CD-Rs with cyanine green or azo blue dye layers will decay the most.

Methods/Materials
Materials: -Light chamber with a reflective interior holding two, two tube 25 watt fluorescent light fixtures 36 inches above the samples -Lead-lined, photographers film bag -20 paper CD sleeves -20 CD-Rs of five different brands -FTK Imager 2.5.3 -CD/DVD Inspector Version 2.1.4 -CD burning software -Computer with a CD writer -Log Book

Procedure: A known 1 MB file was generated. 698 identical copies of the known file were placed on each sample and confirmed with forensic software. 20 of the 100 CD-Rs, four from each brand, were stored in a lead-lined photographer#s bag as a control. The 80 test samples, 16 of each brand, were placed in the fluorescent light chamber. Test samples and controls were maintained at manufacturers# recommended temperature (76-82 degrees Farenheit) and humidity (30-52%). All 698 files on all 100 pieces were compared to the known weekly using commercially available CD-R optical media read/write drives, and forensic software to detect bit level errors in each file on each sample. There was minimal exposure of the samples to incandescent or sunlight.

Results
All 16 Comp USA CD-R test samples, which used a cyanine green or azo blue dye layer had data loss. Most often, the Table of Contents was damaged, rendering the entire CD-R inaccessible or unreadable. None of the Comp USA control samples failed, therefore the failures were due to the fluorescent light. Degradation was apparent after 936 hours of exposure. After 1092 hours, data loss was over 99%.

Conclusions/Discussion
CD-Rs, especially those with cyanine green or azo blue dye layers degrade under fluorescent light at manufacturer recommended temperature and humidity. The degradation of CD-R optical media under fluorescent light in controlled temperature and humidity has not been extensively studied. Like media should experience significant data loss after approximately 3276 hours or 137 days of exposure.

Summary Statement
CD-R media degrades under fluorescent light, even if maintained at the manufacturer recommended temperature and humidity, causing catastrophic data loss in as little as 137 days.

Help Received
My stepfather, a Computer Analysis Response Team Forensic Examiner, oversaw this experiment. He also assisted with construction of the light chamber. My mother helped with the display board. Mr. Eric Thompson, CEO of Access Data, provided the forensic software used, FTK Imager 2.5.3.