NATIONALMUSEET

Dust

A method for sampling and analysing dust on museum objects

Maria-Louise Jacobsen
Departement of Conservation, The National Museum of Denmark

Why develop a method for sampling and analysing dust?

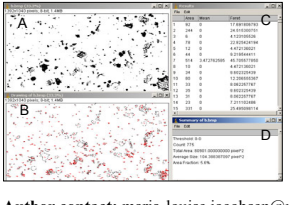
Damage caused by dust has been observed on several different objects and materials and there seems to be a need for general guidelines to reduce the dust exposure. To do so it is necessary to identify the dust in museums by sampling and analyzing. Different methods have been developed for monitoring dust deposition but these are still too expensive and resource consuming to be used routinely. Furthermore, no national or international standard for sampling or analyzing dust exists.
The developed method should be cheap and easy to reproduce and without visual interference in an exhibition.

A method for sampling

Sampling was performed using dust lifters. Glass slides were placed to accumulate dust by natural deposition. After a period of exposure, the dust lifter, which is a sticky gelatin film, was placed over the area of interest, applied with a slight pressure, and then removed with the dust particles adhering to the gel.

A method for analysing

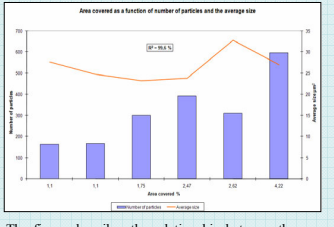
From digital images of the dust samples (by microscope camera), image analysis was done using Image J, a public domain Java image-processing program. The dust deposition level can be defined as the number of particles per area unit, and the area fraction covered by particles. By processing images of the dust samples with Image J, it was possible to calculate particle count, area fraction and size distribution of particles. In this investigation we placed a lower boundary in the program so only coarse particles larger than 2 µm were recorded.
Optical microscopy was used for examining the composition of dust, thus identifying sources. The gel foils can be examined readily by transmitted light in the polarizing microscope



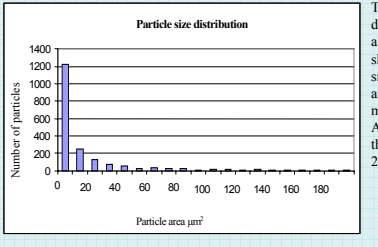
Measurement with Image J.
A: Black/white photo of dust
B: Numbering of each particle
C: Area for each particle
D: Results: The number of particles, the particles average size and the area covered with dust

Author contact: maria-louise.jacobsen@natmus.dk

The method was put to use for collecting, measuring and analyzing dust from various locations including four exhibition rooms and four storage areas. The period of exposure was 1-12 months.
This poster shows the results from the measuring and analyzing of the sampled dust.

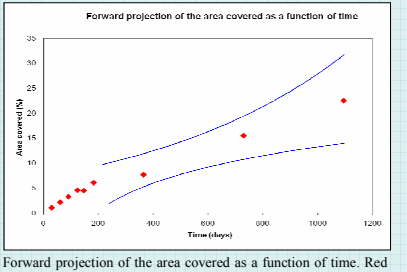


The figure describes the relationship between the area covered with dust as a function of the number of particles as well as their average size. It is found that the number of particles and their average size can explain more than 99% of the variation in the area covered with dust. Each column depicts a sample. These have been gathered on a monthly interval.



The size distribution for all samples shows that the smaller particles are in the majority. Approx. 2/3 of the particles is < 20 µm².

The results suggest a tendency for an accumulation of the number of particles for the first six months of exposure; subsequently a slower accumulation or stagnation is observed.



Forward projection of the area covered as a function of time. Red spots illustrate the data; the red spots between the blue lines illustrate the mean of the forward projection. The blue lines illustrate the upper and the lower limit of the confidence interval.

Many types of particles are readily identified, and the particles origin from humans, from the building and from outside.