

The use of low temperature plasma for gelatin photography treatment

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Gelatin photographs, an important part of cultural heritage, are the most prevalent in photographic collections. New non-destructive treatment options are being invented in the protection of cultural heritage. Some information regarding the use of low-temperature atmospheric plasma in the field of cultural heritage objects, including photography, has been published over the last few years. The use of plasma seems to be a perspective method for both, photographs decontamination and optical properties improvement too. At this point it is necessary to identify the effect on long term gelatin photographs stability.

The aim of our work is to investigate the effect of ADRE air-plasma on the optical properties and structure of gelatin as the main component of the photographs image layer. Strips of FomaBrom N112 and N111 photopaper were used as model samples. The changes were evaluated using densitometry, colorimetry and ATR-FTIR spectroscopy. Based on the densitometry and colorimetry measurements, it can be stated, that changes in optical density and colorimetric coordinates after the ADRE air-plasma treatment are negligible, as the plasma processing did not cause any damage to the photographic image. In ATR-FTIR spectrum we found that due to plasma activity, the Amid I/Amid II ratio slightly increased, which indicates possible hydrolytic damage of gelatin. After FTIR spectroscopy measurements, the light aging test in Q-Sun chamber was performed, with no significant color changes in plasma treated and non-plasma treated samples. Plasma treated samples with higher optical density showed higher oxidation products growth compared to non-plasma treated samples.

It has been proved, that using low temperature plasma has no significant negative effect on the gelatin photographs. Plasma can be therefore considered as a suitable method for cleaning and microbial decontamination of photographs.