

Deterioration mechanism and key techniques of conservation of brittle curled historical photographs

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Abstract Severe brittleness, curl and even fracture, and other self-destructive diseases on the gelatine paper-based photographs with important historical value seriously damaged the safety of these cultural relics. However, people lack attention to its microstructure, disease mechanisms, and restoration methods. This paper mainly includes the following three aspects. (1) Firstly, we study the current state of the Republican historical photographs with badly brittle, curled and broken characteristics in the Second Historical Archives of China. Subsequently, on the analysis basis of their material structures and compositions, simulated samples with different degrees of curl and shrinkage were prepared by regulating the humid-heat environment to study the influence of the humid-heat environment on the changes of regular curl and shrinkage, further to reveal the correlation between the microstructure of photographs and the curling changes. (2) A study on the mechanism of conformational changes in gelatine paper-based photographs under the dry-wet cycles. The gelatine film samples with different shrinkage rates were firstly prepared through alternating dry-wet cycles. Then, through the correlation between the molecular structure, crystallinity, functional group change and macroscopic properties of gelatine films with different shrinkage changes were explored, and the mechanism of the curling and brittle fracture caused by the change of gelatine properties under the dry-wet cycles was revealed. (3) Research on the restoration and conservation of brittle and curled historical photographs. On the basis of previous disease mechanism, an amphiphilic glycerol triglycidyl ether emulsion was developed to improve the flexibility of photographic based on gelatine, and the restoration process of dissolution and depolymerization, flattening and shaping was designed to eliminate the brittle and curling disease of gelatine paper-based photographs. This method has been successfully applied to the restoration and conservation of several historical photos in China, and good results have been achieved.

Key words photographic gelatine, paper-based photographs, embrittlement curling, plasticizing flattening, restoration and conservation.