

Characterization of Silver Image Formation in a Silver Behenate Photothermographic Imaging Element Using X-Ray Diffraction Techniques

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Abstract

The quantitative assessment of silver development efficiency and covering power in silver-based imaging elements requires an accurate determination of the coverage of silver metal (Ag(0)) formed as a result of post-exposure image development. The thermographic and photothermographic imaging processes do not incorporate a silver source removal-fixing step. Therefore, it has been necessary to develop an analytical technique that is capable of providing a quantitative determination of the Ag(0) coverage in the presence of silver salts and complexes. An X-ray diffraction method has been developed that is based on the correlation between silver metal diffraction peak area intensity and silver metal coverage present in the final image area. It has been demonstrated that this methodology may be used for the assessment of the development efficiency, covering power, and quantum efficiency in photothermographic, silver behenate-based imaging elements. The use of X-ray diffraction techniques has been extended to characterization of crystallinity, morphology, and crystallite size of micro- and nano-silver behenate particulates.