

John Quinn

Restoration of Manipulated Serial Numbers Using Electron Backscatter Diffraction

Serial numbers can be manipulated by criminals to try and make them unidentifiable (scraped off). The goal of this study is to re-identify these manipulated serial numbers more effectively than they are being re-identified today. The method of re-identifying that is used today is chemical etching where a prescribed etchant is used to reveal deformation in the grain structure of the material caused by the stamp of the serial number (60 % effective). A new way to re-identify serial numbers is using Electron Backscatter Diffraction (EBSD). EBSD re-identifies the serial number by using the backscattered electrons interference pattern. EBSD finds grain structure at higher magnification than optical techniques used in etching and also can be used to measure crystal damage through a quality index. In this project EBSD is compared to etching. Samples of 17-4 stainless steel were stamped with an “s” using a hydraulic test machine under displacement control to create a series of uniform samples. The “s” in the samples was polished off so it could not be seen and then etched with Fry’s Reagent. The samples were then polished to multiple depths, etched and imaged with EBSD. Electron Backscatter Diffraction was able to identify the “s” at greater depths (up to 90 μm) than the etching method. The wet etching process takes considerable skill and experience of a trained metallurgist with specific knowledge of the alloy and etchant, whereas the EBSD method can use the same standard procedure for most alloys.