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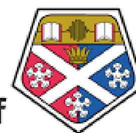

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In-situ study of corrosion of commercial SD memory card by local electrochemical techniques

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Abstract

Nowadays, due to living in an era of highly sophisticated electronic and communication technology, micro- and nano-electronic devices have extended to all aspects of our daily life. Corrosion deterioration in the micro- and nano-scale of electronic devices, in which a number of metallic components exist in different forms, leads to a decrease in the electrical performance, efficiency and lifetime. Due to a colossal surface-to-volume ratio of small-scale electronic devices, corrosion deterioration including galvanic coupling, crevice corrosion, and even uniform corrosion significantly influences the performance and lifetime of the devices. Fundamental understanding of corrosion behavior of miniature electronic devices in their service environments could lead to superior long-term stability of the system through a knowledge-based design of materials and protective coatings. The objective of this work is to obtain a comprehensive understanding of the localized corrosion behavior of the final metallic finish of the commercial SD memory cards, electroless nickel immersion gold (ENIG), by applying surface analysis and scanning electrochemical techniques with high-lateral resolution. In order to achieve this, Atomic Force Microscopy (AFM), Scanning Kelvin Probe Force Microscopy (SKPFM), Scanning Electrochemical Microscope (SECM), Scanning Vibrating Electrode Technique (SVET), and Scanning Electron Microscopy (SEM) are used to investigate the in-situ corrosion phenomena exposed to different corrosive environments. Combining the morphological and electrochemical techniques will provide complementary information to elucidate the in-situ corrosion mechanisms possibly leading to electronic device failures, i.e. predestined sites for initiation, and kinetics and preferable direction of corrosion propagation.