

DEVELOPMENT & APPLICATION OF DIELECTRIC DISCHARGE ULTRAVIOLET EXCIMER LAMPS TO THIN OXIDE FILM GROWTH AND ANNEALING

Ian W. Boyd

Electronic and Electrical Engineering and London Centre for Nanotechnology,
University College London,
Torrington Place, London WC1E 7JE, United Kingdom

Abstract

Ultraviolet (UV) photon-induced processes offer many unique advantages for thin oxide film growth and surface modification, such as reduced temperatures and lack of presence of accelerated ionic species. For such applications, the principles and properties of UV and vacuum ultraviolet (VUV) radiation generated by the natural decay of excimer complexes will be described. The so-called dielectric or “silent” discharge excimer lamps based on this principle provide very high intensity, narrow-band radiation centred around 20 distinct UV and VUV wavelengths from 126-354nm, and are highly efficient (with no self absorption), and can provide high photon fluxes over large areas.

The design and development of these novel sources will be discussed, including their application towards photo-deposition of a range of high- and low-dielectric-constant oxide layers, low-temperature oxidation of Si and SiGe as well as oxide annealing. Results show that very good quality layers can be fabricated, with the properties of tantalum pentoxide being amongst the best yet reported. These relatively low cost lamp systems can provide an interesting low temperature alternative for large-scale materials processing in a wide range of industrial sectors.