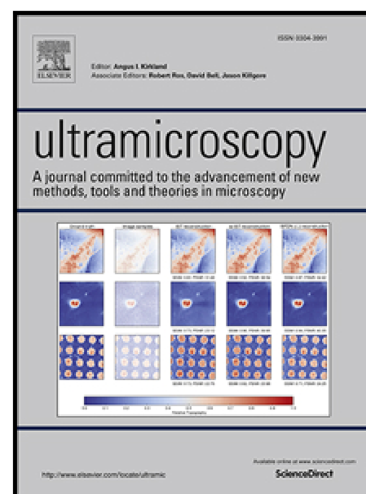
Accepted Manuscript



Charge dynamics in aluminum oxide thin film studied by Ultrafast Scanning Electron Microscopy

Maurizio Zani , Vittorio Sala , Gabriele Irde ,
Silvia Maria Pietralunga , Cristian Manzoni , Giulio Cerullo ,
Guglielmo Lanzani , Alberto Tagliaferri

PII: S0304-3991(17)30490-4
DOI: 10.1016/j.ultramic.2018.01.010
Reference: ULTRAM 12523

To appear in: *Ultramicroscopy*

Received date: 15 November 2017
Revised date: 16 January 2018
Accepted date: 17 January 2018

Please cite this article as: Maurizio Zani , Vittorio Sala , Gabriele Irde , Silvia Maria Pietralunga , Cristian Manzoni , Giulio Cerullo , Guglielmo Lanzani , Alberto Tagliaferri , Charge dynamics in aluminum oxide thin film studied by Ultrafast Scanning Electron Microscopy, *Ultramicroscopy* (2018), doi: 10.1016/j.ultramic.2018.01.010

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Charge dynamics in aluminum oxide thin film studied by Ultrafast Scanning Electron Microscopy

Maurizio Zani [1, *], Vittorio Sala [1, 2, *], Gabriele Irde [1, 2], Silvia Maria Pietralunga [2, 3], Cristian Manzoni [3], Giulio Cerullo [1,3], Guglielmo Lanzani [1, 2], Alberto Tagliaferri [1, 2]

1) Dipartimento di Fisica, Politecnico di Milano, Piazza Leonardo da Vinci 32, Milano, Italy

2) CNST@PoliMi, Istituto Italiano di Tecnologia (IIT), Via Giovanni Pascoli 70/3, Milano, Italy

3) Istituto di Fotonica e Nanotecnologie (IFN), CNR, Piazza Leonardo da Vinci 32, Milano, Italy

* Authors contributed equally to this work

Corresponding author: maurizio.zani@polimi.it

Abstract

The excitation dynamics of defects in insulators plays a central role in a variety of fields from Electronics and Photonics to Quantum computing. We report here a time-resolved measurement of electron dynamics in 100 nm film of aluminum oxide on silicon by Ultrafast Scanning Electron Microscopy (USEM). In our pump-probe setup, an UV femtosecond laser excitation pulse and a delayed picosecond electron probe pulse are spatially overlapped on the sample, triggering Secondary Electrons (SE) emission to the detector. The zero of the pump-probe delay and the time resolution were determined by measuring the dynamics of laser-induced SE contrast on silicon. We observed fast dynamics with components ranging from tens of picoseconds to few nanoseconds, that fits within the timescales typical of the UV color center evolution. The surface sensitivity of SE detection gives to the USEM the potential of applying pump-probe investigations to charge dynamics at surfaces and interfaces of current nano-devices. The present work demonstrates this approach on large gap insulator surfaces.

Keywords

USEM; Ultrafast Scanning Electron Microscopy; Aluminum oxide; Secondary Electrons dynamics; Color centers charge dynamics; Lock-in detection

ACCEPTED MANUSCRIPT

Download English Version:

https://daneshyari.com/en/article/8037717

Download Persian Version:

https://daneshyari.com/article/8037717

Daneshyari.com