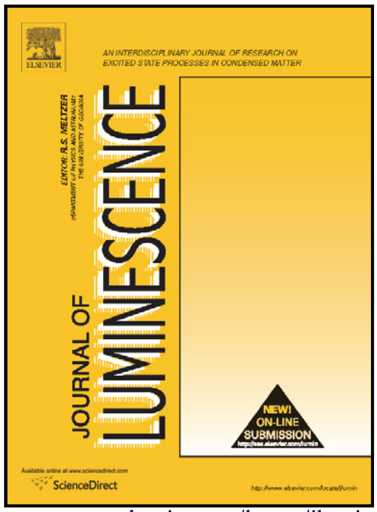
Author's Accepted Manuscript



www.elsevier.com/locate/jlumin

Time-Resolved Measurements of Luminescence

Bradley B. Collier, Michael J. McShane

PII: S0022-2313(13)00372-4
DOI: http://dx.doi.org/10.1016/j.jlumin.2013.06.034
Reference: LUMIN11983

To appear in: *Journal of Luminescence*

Received date: 11 April 2013
Revised date: 10 June 2013
Accepted date: 27 June 2013

Cite this article as: Bradley B. Collier, Michael J. McShane, Time-Resolved Measurements of Luminescence, *Journal of Luminescence*, http://dx.doi.org/10.1016/j.jlumin.2013.06.034

TIME-RESOLVED MEASUREMENTS OF LUMINESCENCE

Bradley B. Collier[1] and Michael J. McShane[1,2]*

[1]Department of Biomedical Engineering and [2]Materials Science and Engineering Program

5045 Emerging Technologies Bldg. MS 3120

Texas A&M University, College Station, TX 77843

1. ABSTRACT

Luminescence sensing and imaging has become more widespread in recent years in a variety of industries including the biomedical and environmental fields. Measurements of luminescence lifetime hold inherent advantages over intensity-based response measurements, and advances in both technology and methods have enabled their use in a broader spectrum of applications including real-time medical diagnostics. This review will focus on recent advances in analytical methods, particularly calculation techniques, including time- and frequency-domain lifetime approaches as well as other time-resolved measurements of luminescence.

2. INTRODUCTION

In recent years, optical sensing has become more widespread due to several inherent advantages. Specifically, optical sensors offer improved measurement flexibility, fast response time, reversibility, and nanoscale resolution compared to electrochemical techniques [1-3]. The optical component of these sensors is monitored for changes in optical properties including luminescence intensity and wavelength shift of absorbance, reflectance, or luminescence. Luminescence measurements are of particular interest because of the vast number of analyte-

---

* mcshane@tamu.edu

Abbreviations: fluorescence lifetime imaging (FLIM), time-domain (TD), frequency-domain (FD), least-squares (LS), non-linear least squares (NLS), linear least-squares (LLS), phase-plane method (PPM), maximum likelihood estimator (MLE), rapid lifetime determination (RLD), generalized RLD (GRLD), multi-window RLD (MRLD), integration for extraction method (IEM), lifetime assisted ratiometric sensing (LARS), dual-frequency lifetime discrimination (DFLD), dual-lifetime referencing (DLR), ratiometric dual phase shift (RDP), dual lifetime determination (DLD), modified DLR (m-DLR)