Optimization and quantification of surface enhanced infrared absorption using gradient gold island films

C. Kratz, T.W.H. Oates, K. Hinrichs

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Optimization and quantification of surface enhanced infrared absorption using gradient gold island films

C. Kratz[a,*], T. W. H. Oates[a], K. Hinrichs[a]

[a] *Leibniz-Institut für Analytische Wissenschaften -ISAS- e.V., Department Berlin, Schwarzschildstr. 8, 12489 Berlin*

Abstract

Enhancement substrates of gold island films as studied in this work exhibit surface enhanced infrared absorption and are widely used for biosensing. The enhanced infrared absorption is optimized and quantified using thickness gradient substrates of gold island films covered with self-assembled monolayers of 4-mercaptobenzonitrile. Structural and optical properties of the bare and modified enhancement substrates are determined by various methods. A priori indication of the enhancement is obtained by the correlation of effective film thickness and surface enhanced infrared absorption activity.

Keywords: ellipsometry, surface enhanced infrared absorption, gold island films, IR-spectroscopy, plasmonic resonance, gradient thickness substrate

1. Introduction

The absorption of infrared (IR) radiation by molecules adsorbed on metal island films is greatly enhanced by the effect of surface enhanced infrared absorption (SEIRA)[1–6]. The enhancement factors observed in SEIRA are modest (10^1 - 10^3) compared to those observed in the complementary method of surface enhanced Raman scattering (SERS) (10^6 - 10^{12}). Both SERS and SEIRA are of growing interest in biological and medical applications [7–9]. Demonstration of SEIRA based immunoassays [10], studies of nucleic acids [11], DNA [12], protein

*Corresponding author
Email address: Christoph.kratz@isas.de (C. Kratz)