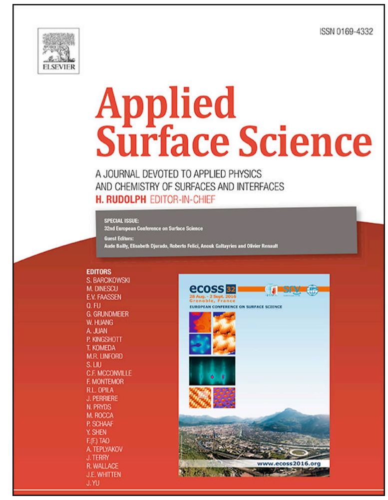
Accepted Manuscript



Full Length Article

Angle-dependent sputter yield of rippled surfaces

V.I. Shulga

PII: S0169-4332(18)31956-1
DOI: https://doi.org/10.1016/j.apsusc.2018.07.059
Reference: APSUSC 39874

To appear in: *Applied Surface Science*

Received Date: 14 April 2018
Revised Date: 9 July 2018
Accepted Date: 10 July 2018

Please cite this article as: V.I. Shulga, Angle-dependent sputter yield of rippled surfaces, *Applied Surface Science* (2018), doi: https://doi.org/10.1016/j.apsusc.2018.07.059

Angle-dependent sputter yield of rippled surfaces

V.I. Shulga[1]
Skobeltsin Institute of Nuclear Physics, Lomonosov Moscow State University, 119991 Moscow, Russia

Abstract

Atomistic (binary-collision) simulation is used to study the sputter yield of rippled C and Si surfaces bombarded with Ar and Ga ions in a wide range of incidence angles and energies. This study was motivated by conflicting theoretical predictions of results when the ion energy is varied. Most simulations refer to a sinusoidal ripple topography with h/λ = 0.05-0.15, where h and λ are the amplitude and wavelength of ripples, respectively. Results are compared with Monte Carlo simulation based on Sigmund's continuum model of ion sputtering and not tied to a specific ion-target combination. Both types of simulation do not confirm a strong suppression of the angular variation in the sputter yield from rippled surfaces with increasing ion energy, predicted theoretically (Makeev & Barabási, 2004).

Keywords: ion bombardment, surface sputtering, rippled surfaces, computer simulation.

1. Introduction

Ion bombardment of solids leads to erosion of material surfaces and can dramatically change their topography. Ion-induced surface structures, chaotic or well-ordered, can cover large areas of the surface and strongly affect its sputtering characteristics, including the sputter yield (i.e. the number of sputtered atoms per incident ion), important for applications [1]. One of the varieties of ordered surface structures are periodic self-organized ripples that can arise under bombardment of solids with medium energy ions (~1-100 keV) at off-normal incidence [2-5]. Ripples often have an almost sinusoidal shape, but with grazing ion incidence may undergo a transition to quasi-triangular (faceted) structures due to the interplay between sputtering and shadowing effects (e.g. [3]).

Evaluation of the yield of sputtering from rough surfaces is a long-standing problem. For sinusoidally rippled surfaces, a comprehensive theoretical study of the sputter yield was carried out by Makeev and Barabási (MB) [6] in terms of Sigmund's theory of ion sputtering [7]. The

1 *E-mail address*: vish008@yandex.ru