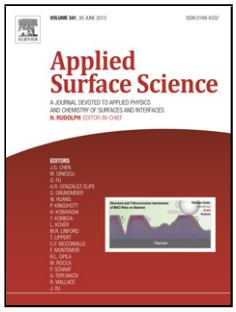

Title: Transparent film with inverted conical microholes array for reflection enhancement

Author: Biao Lei Hongzhong Liu Weitao Jiang Bangdao Chen Yongsheng Shi Lei Yin Xiaokang Liu

PII: S0169-4332(16)30215-X
DOI: http://dx.doi.org/doi:10.1016/j.apsusc.2016.02.055
Reference: APSUSC 32573

To appear in: *APSUSC*

Received date: 24-8-2015
Revised date: 11-1-2016
Accepted date: 4-2-2016

Please cite this article as: B. Lei, H. Liu, W. Jiang, B. Chen, Y. Shi, L. Yin, X. Liu, Transparent film with inverted conical microholes array for reflection enhancement, *Applied Surface Science* (2016), http://dx.doi.org/10.1016/j.apsusc.2016.02.055

Transparent film with inverted conical microholes array for reflection enhancement

Biao Lei [1], Hongzhong Liu*[1], Weitao Jiang*[1], Bangdao Chen[1], Yongsheng Shi[1], Lei Yin[1], Xiaokang Liu[2]

[1] State Key Laboratory for Manufacturing Systems Engineering, Xi'an Jiaotong University, Xi'an 710049, China

[2] Engineering Research Center of Mechanical Testing Technology and Equipment, Chongqing University of Technology, Chongqing 400050, People's Republic of China

E-mail: hzliu@mail.xjtu.edu.cn, wtjiang@mail.xjtu.edu.cn

Abstract

PDMS has been widely utilized for microfluidic chips and microchannel detections, as its good optical properties are the prerequisite to achieve accurate and efficient detection. However, it is difficult to obtain effective information for opaque liquids. With the development of microchannel detection for wider fields, it is imperative to obtain more comprehensive information of the observed objects by integrating high transmission with enhanced reflection. This article investigates reflection enhancement by Polydimethylsiloxane (PDMS) film with inverted conical microholes array. PDMS film with inverted conical microholes array is fabricated by replication from the silicon mold with inverted microcones array which is prepared by Inductively Coupled Plasma (ICP) etch tool. The monolayer PDMS film with inverted conical microholes array shows a two-fold effectively increase in reflection, approximately up to 15%, at a broad wavelength range of 637-1131nm and 1214-1350nm, compared with bare PDMS film. In addition, the reflection can be further enhanced by multilayered lamination of PDMS film with inverted conical microholes array, and the enhancement is also dependent on the lamination way, i.e., for bilayer laminations, the maximum reflection enhancement occurs when with face-to-back lamination, and 32.79% larger than that with back-to-face lamination. From the experiments, the maximum reflectivity of 8-layered PDMS films can obtain 64.4% while the maximum reflectivity of monolayer PDMS film barely has 17.5% .The transparent film with inverted conical