

Determination of nano-roughness for micro-objects by measuring the van der Waals force

Bratina, B.^{a,*}, Šafarič, J.^a, Uran, S.^a, Šafarič, R.^a

^aFaculty of Electrical Engineering and Computer Science, University of Maribor, Maribor, Slovenia

ABSTRACT

3D printing or assembly techniques in the micro/nano-world enable production of micro-parts for building small machines or structures for biomedicine applications, such as cultivation of living cells in the field of Tissue Engineering. Micro-sized assembly requires automated manipulation procedures and methods for determination of suitable objects for assembly. The latter is possible by van der Waals force measurement and determination of distance at the van der Waals peak between two objects in contact. They are dependent not only on the Hamaker coefficients of the materials in contact and their geometries, but also on the nano-roughness asperities and crystal structure asperities of the contact surfaces. A method is presented for measuring van der Waals` force and determining micro-objects` (sizes between 10-100 μm) distances between materials in contact at the van der Waals peak in the presence of nano-roughness and crystal structure roughness. The proposed model was validated by experimental lab results between various materials and shapes (glass and polystyrene beads, metallic wires).

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*Corresponding author:

bozidar.bratina@um.si
(Bratina, B.)

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