INVESTIGATION ON THE EFFECTS OF INITIAL STRESS STATE OF POWDER PACKING ON MACROSCOPIC POWDER FLOW PROPERTIES

Saeed Albaraki, S Joseph Antony

a. Corresponding author (pmsmaa@leeds.ac.uk)

To measure the distribution of maximum shear stress inside powders stored initially under confined flow geometries using advanced photo stress analysis tomography (PSAT),flow profiles of powders using colour coding technique [1,2] and finding correlations between them. Method: Novel stress-responsive birefringent (sensor) powder (300µm-1000µm) has been developed in our laboratory and used for this study to measure the shear stress (tmax) distribution within particles fed in conical hoppers. The macroscopic powder flow profiles have been visualised by applying colour coding technique. Results and discussion: In general, the magnitude of maximum shear stress within hopper increases for decrease in internal angle of opening. When the internal angle of the hopper geometry becomes higher, tmax tends to become more dominant towards the wall and much less in the middle region powder packing. The direction of the major principal shear stress was mostly along the direction of gravity for the smallest internal angle of opening. The dynamic flow profiles results are in full agreement with the PSAT results in general, and show clearly the effect of initial stress state of powders on dynamic flow properties. Conclusions: The study provides valuable links between microscopic stress fields to potentially macroscopic flow characterisation of particulate processes.

LIGHT-EMISSION IN POROUS SIO(X):C NANO-COMPOSITES

A.V. Vasin[1], A. V. Rusavsky[1], V.A.Tyortyh[2], I.N. A.N. Nazarov[1], V.S. Lysenko[1]
[1]Inst. of Semiconductor Physics, NAS of Ukraine, Kyiv, Ukraine
[2]Inst. of Surface Chemistry. NAS of Ukraine, Kyiv, Ukraine
a. Corresponding author (andriyvasin@gmail.com)

White light emitting nano-composite material (SiO_2:C) is one of new promising materials for artificial lighting and/or light indication devices as phosphor converting ultraviolet radiation into white light. The most advantages of this material are those: (1) spectral properties of the photoluminescence (PL) of por-SiO2:C can be tuned almost ideally to that of natural day light and (2) material does not contain heavy metal dopants. In present report the light-emitting carbon incorporated porous silicon oxide layers (por-SiO_2:C) were fabricated by successive procedure of thermal treatment of porous silicon in flow of acetylene (in temperature range of 1100-1300 K) followed by oxidation in flow of wet argon in temperature range of 900-1000 K. The other type of nanostructured SiO_2:C composites in form of powder were fabricated by successive chemical modification of fumed silica (specific surface area of 300 m^2/g) with toluene solution of phenyltrimethoxysilane followed by calcinations at temperature up to 700 C in nitrogen flow. Correlations of fabrication conditions, local bonding structure and light emission properties were studied. It is demonstrated that white light emission is, most likely, associated with carbon nano-clusters incorporated in silica matrix.