Matrix Assisted Pulsed Laser Evaporation for growth of fullerene thin films

Canulescu, Stela; Schou, Jørgen; Fæster Nielsen, Søren

Publication date:
2011

Matrix Assisted Pulsed Laser Evaporation for growth of fullerene thin films

S. Canulescu[1,a,*], J. Schou[1,b], and S.F. Nielsen[2,c]

[(a,b)]Department of Photonics Engineering, Risø Campus, Technical University of Denmark, DK-4000 Roskilde, Denmark

[(c)]Materials Research Division, Risø National Laboratory for Sustainable Energy, Technical University of Denmark, DK-4000 Roskilde, Denmark

[a]stec@fotonik.dtu.dk, [b]josc@fotonik.dtu.dk, [c]sfni@risoe.dtu.dk

*Corresponding author

C_{60} fullerene thin films of average thickness of more than 100 nm can be produced in vacuum by matrix-assisted pulsed laser evaporation (MAPLE). A 355 nm Nd:YAG laser was directed onto a frozen target of anisole with a concentration of 0.67 wt% C_{60}. At laser fluences below 1.5 J/cm^2, a dominant fraction of the film molecules are C_{60} transferred to the substrate without any fragmentation. High-resolution SEM images of MAPLE deposited films reveal large circular droplets on the surface with high amount of material concentrated at edges (Fig. 1A). These features, observed over a wide range of laser fluences, are caused by ejection of large matrix-fullerene liquid droplets into the gas-phase and subsequent deposition. At similar laser energies, but using an unfocused laser beam, MAPLE favours evaporation of matrix and organic molecules, resulting in production of films with smooth surfaces and minimal contamination (Fig. 1B).

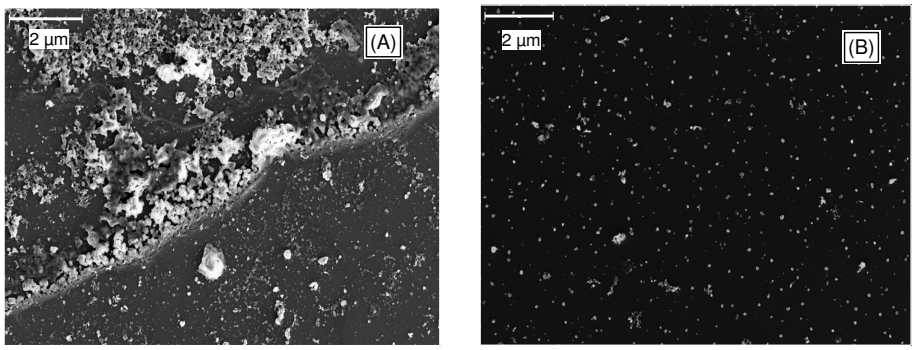

Fig.1 SEM images of MAPLE deposited films of C_{60}. The micrographs show the edge of a droplet observed in rough surfaces (A) and uniform deposition of smooth films (B).