Versatile reactor for LCVD large films production

O Conde, A M Deus, M L G Ferreira and A C Silvestre,
CFC/INIC, Departamento Física/Faculdade de Ciências de
Lisboa, Lisboa, Portugal

and

R Vilar, Departamento Eng de Materiais/Instituto Superior
Técnico

Laser chemical vapour deposition (LCVD) is a most recent thin film production technique, using laser radiation to induce reactions in the vapour phase (photolytic LCVD) or in the interface between the vapour phase and the radiation heated substrate (pyrolytic LCVD). This technique allows direct fine tracing, useful for the production of electronic components, as well as complete surface coatings for mechanical components resistant to oxidation or abrasion.

The difficulties associated with the construction of pilot-scale reactors for pyrolytic LCVD with a CO\textsubscript{2} laser, are mainly the reactants' chemical aggressivity and the relative motion of the sample to the laser beam. As a consequence, the chambers described in the literature have small dimensions and only allow studies of reaction mechanisms and kinetics.

The reactor whose characteristics are described was developed as a response to the need for large (LCVD prepared) films.

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Mass spectroscopy of clusters*

E Reenagel, Facultät für Physik, Unio Konstanz, D-7750 Konstanz
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Cluster physics forms the transition between the well-established fields of atomic/molecular physics and solid state physics. The lecture gives an introduction to the basic ideas and experiments concerning van der Waals, ionic and metallic clusters. Clusters are generated by different techniques: adiabatic expansion, condensation of atomic and molecular vapours in noble gases. In most cases, time-of-flight techniques are used for mass selection of clusters containing up to 1000 atoms. From the mass distribution, information can be deduced about magic numbers and geometrical configurations about stability and other physical properties of the clusters. A discussion about future developments concludes the lecture.

* Invited.

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Ultra-high vacuum deposition processes under microprocessor control*

J A Koprin, Balzers AG, FL-9495 Balzers, Liechtenstein

Modern solid state and semiconductor research requires powerful and flexible methods to produce, study and characterize advanced materials and structures. The reasons for selecting ultra-high vacuum (UHV) methods for these purposes can be divided into different categories as listed below. In most cases however, it is the combination of any of the following possibilities that makes UHV technology such an attractive and flexible tool.

(a) Control of substrate conditions: chemistry, morphology, residual gas load, etc.
(b) Control of reactions of the thin film before, during and after deposition: the high reactivity of the deposition materials and/substrates towards residual gases often requires that the deposition rate exceeds the impingement rate of reactive residual gases, i.e. low residual gas pressure. In reactive deposition processes it is the suppression of undesirable reaction paths which is sought.
(c) Control of deposition conditions: UHV techniques allow control of deposition at very low rates in order to produce epitaxial growth and/or total film thicknesses in the order of monolayers (even of highly reactive films), co-deposition of different materials with accurate compositions and also sequences of films resulting in multilayer structures with new properties.
(d) Control of the growth conditions (subsequent to deposition): due to the inherent compatibility of the method with high temperatures (bakeout), high substrate temperatures are...