

A Process for Synthesis of Crystalline Rubrene Incorporated Thin Film

Brief description:

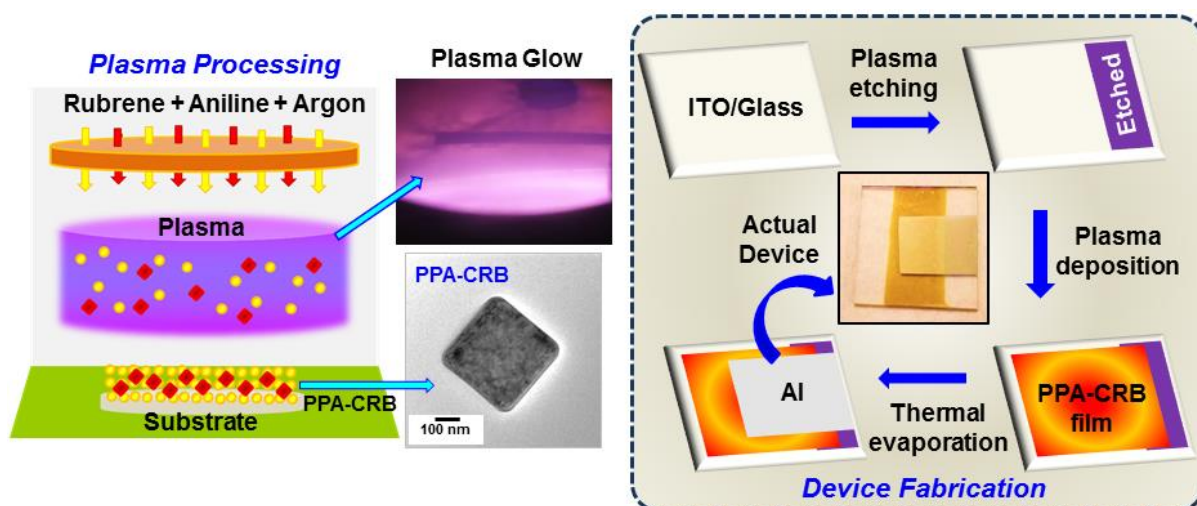
This process is an alternative synthetic approach by means of plasma processing to transform an amorphous polycyclic aromatic organic material to crystalline form and to deposit thin films containing the crystalline phase of the material useful for optoelectronic applications.

Details about the technology:

The invention is directed to the preparation of crystalline organic semiconductor incorporated thin films using rubrene by plasma nanotechnology. The aspiration is to overcome the existing complicated preparation procedure which is mainly via high vacuum vapour transport technique or via complex layered structure formation and subsequent annealing to produce organic semiconductor thin films.

The methodology of this process comprises the following steps:

- i) Preparation of precursor containing rubrene dissolved in solvent aniline: We have used a plasma nanotechnology based method to prepare the polymer-rubrene system, where a solution of rubrene in aniline solvent is used as the precursor for the synthesis. The plasma nanotechnology based method distinguishes our synthesis procedure from the other processes reported till date. The rubrene in aniline solution is prepared in a particular ratio followed by ultrasonic treatment to form a well-mixed precursor for the plasma synthesis.
- ii) Transporting the as-prepared precursor into the plasma reactor for synthesis of thin films: The aniline-rubrene mixture, in vapor form, is injected into the reactor at a range of flow rates controlled by a vapour source mass flow controller.
- (iii) Single-step plasma deposition of crystalline rubrene incorporated thin films by RF discharge: The plasma deposition is facilitated by applying RF power to the electrode assembly. The films are deposited at a rate of 10-20 nm/min on varieties of substrates placed on the electrode.



Schematic of the crystalline rubrene synthesis process and pyro-phototronic device fabrication.

What problem it solves/applicability of the technology:

The prepared thin film has the potential to be useful for fabrication of organic photovoltaic device, pyro-phototronic device, thin film transistor etc. for energy harvesting and sensing.

Patent status:

Title of Patent: *A process for synthesis of crystalline Rubrene incorporated thin film.*

Patent Assignee: IASST, Guwahati

Current Status: Patent active, Patent No. 510863, Indian patent granted (2024)

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