[Scdt] MSE: M.Tech thesis defense of Aman Raj on 9th June at 8:30 am

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Materials Science and Engineering : M.Tech thesis defense notice

Aman Raj (Roll No. 17807086), a BT-MT dual degree student in the Department of Materials Science and Engineering will defend his M.Tech. thesis titled "**Mechanical and Thermal Design of Thin FilmEncapsulation for Flexible Electronics**" as per following details:

Date: June 9th, 2022

Time: 8:30AM

Venue: FB421 (MSE conference room)

All interested are cordially invited to join.

With regards,

Monica Katiyar

(Thesis Supervisor)

MSE, IIT Kanpur

Abstract:
The enhancement of bendability of flexible electronic devices like FOLEDs is critically important for advancements of portable and wearable electronic devices. Thin-film encapsulation (TFE) technology is essential for encapsulating flexible organic light emitting diodes (FOLEDs). As there are several materials and structures that are available for TFE application, a governing design rule for optimizing the bending characteristics of TFE is necessary. In our work, we have proposed TFE on FOLED with moisture barrier incorporating a silica nanoparticle-embedded sol-gel organic-inorganic hybrid nanocomposite (S-H nanocomposite) and Al_2O_3. Non-linear finite-element analysis (FEA) is used to assess the bending characteristics of the FOLED module including the TFE. The neutral axis (N.A.) position of the complete module can be strategically adjusted by the introduction of a polymer buffer layer. The optimized module was evaluated using FEA to assess the improvements achieved in terms of the bending characteristics. In addition to this, heat dissipation is also a crucial aspect to be taken care of for FOLEDs encapsulated using TFE. Conventionally, a separate thick heat sink is used to act as a heat dissipator for the joule heat being produced by the FOLED. In our work, we have demonstrated the effect of inserting thin films of hexagonal boron nitride (Hex B-N) in between the moisture barrier layers. An obvious temperature reduction effect is observed that in turn reflects in terms of low thermal stresses. Furthermore, the effect of increasing the convective heat transfer coefficient and increasing the thickness of the Hex B-N is also studied to achieve an optimal configuration. Further improvements in the bending characteristics of the module can be achieved by modifying the geometry in such a way as to make the hard and brittle layers discontinuous. We have demonstrated via FEA that modifying the geometry in this way can further enhance the bending characteristics of the module while maintaining the required standards for water vapor transmission rates.