

# Morphology of Polypyrrole: Polystyrene Composite Film

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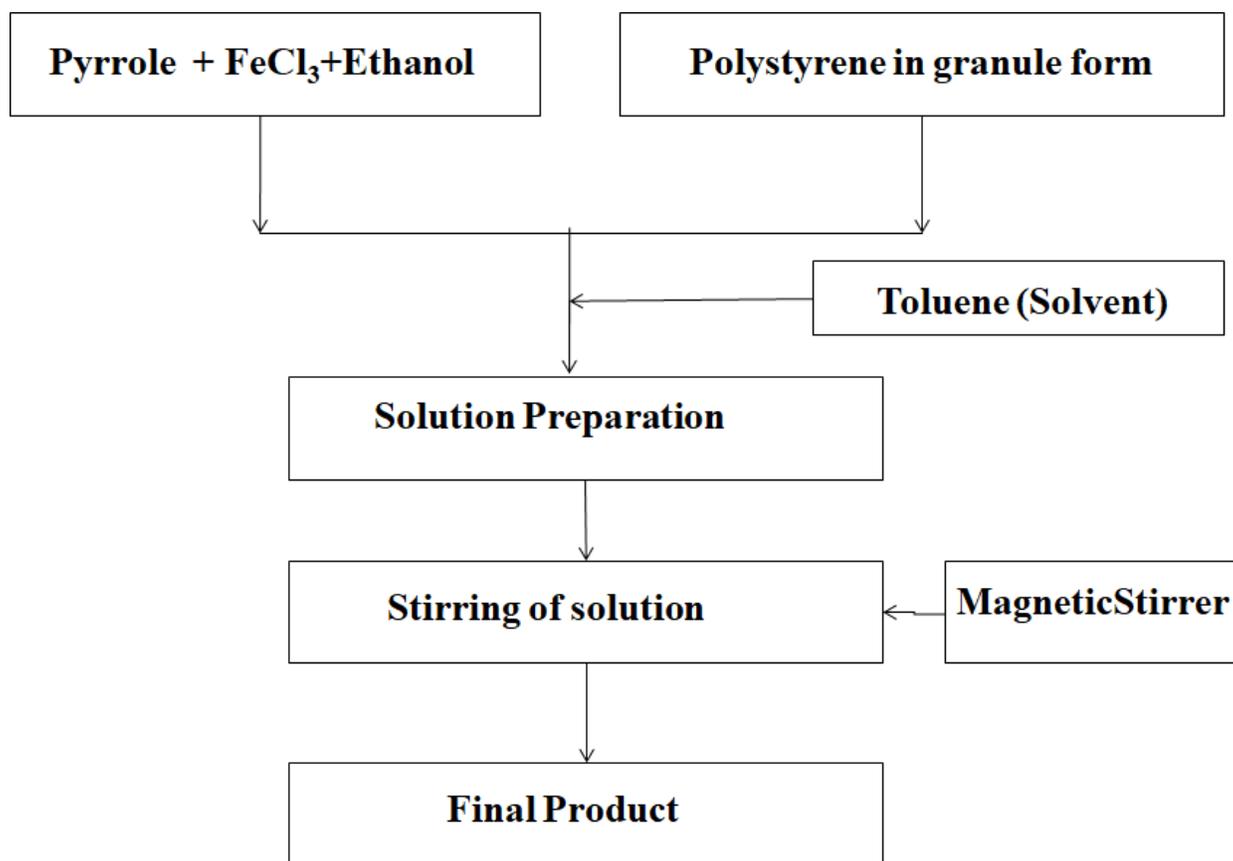
**Abstract:** The thin film of polystyrene doped with polypyrrole was prepared with solution casting method. 5wt% polypyrrole doped polystyrene film was characterized by FESEM to obtain surface morphology. Inclusion of polypyrrole shows growth of Flower-like structure as depicted by FESEM.

## Introduction:

Due to unique physical and chemical properties of polymer composites arises from the combination of parent constituents has attracted the researchers most. These composites are proposed for wide range of applications because of their tunable properties, cost effectiveness etc. [1-3]. Polypyrrole is studied more widely among all conducting polymers due to good stability in environment, cost effective, high conductivity and ease of synthesis [4]. Now days for broad applicability of the polymers with interesting physicochemical properties, researchers have been focused on the fabrication of blend with insulating polymers and hence successful in developing conductive composites. Polystyrene stands out to be first choice due to its interesting properties like low cost, easy processability, availability makes it ideal candidate for blend formation with polypyrrole. Blending of polystyrene with polypyrrole opens new area of applications [5-8].

## Experimental:

Polypyrrole has been prepared by using chemical polymerization method. Ethanol was used as a solvent and  $\text{FeCl}_3$  as an oxidant. Desired amount of pyrrole was added to 25 ml of ethanol and stirred properly. After then  $\text{FeCl}_3$  was added drop wise and then for polymerization solution kept for 24 hours. Thereafter the obtained precipitates were filtered and dried. Solution casting method was used for the preparation of polypyrrole:polystyrene blend [9]. 5wt% of polypyrrole was added into polystyrene, solution stirred properly and poured into petrie dish left to dry to get thin film



Surface morphology:

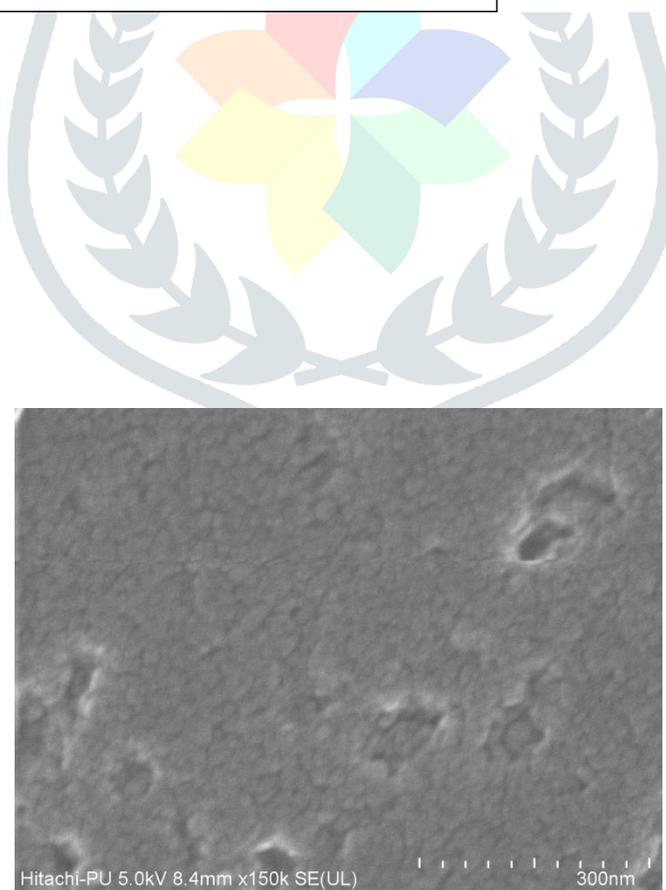
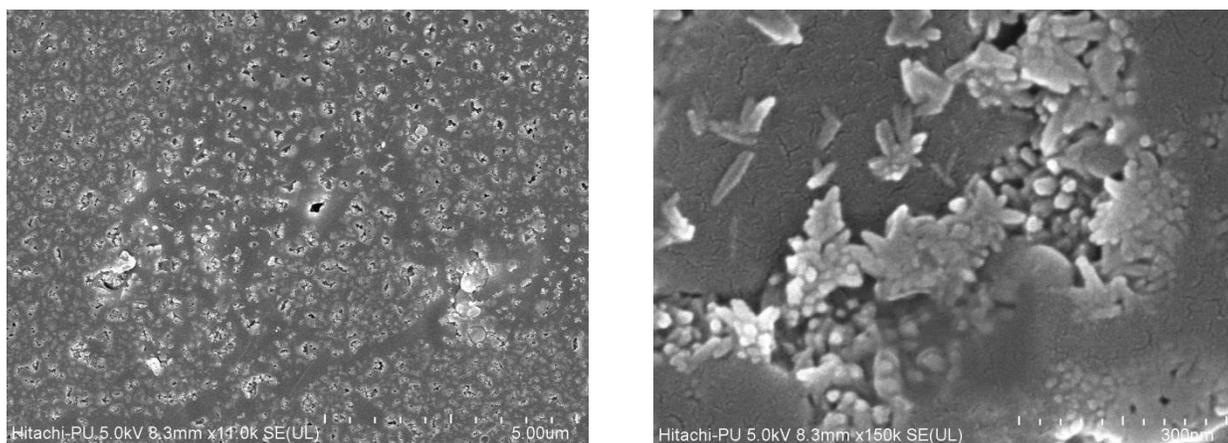


Figure 1: FESEM image of pure polypyrrole



**Figure 2:** FESEM images of 5 wt% polypyrrole:polystyrene

Figure 1 and 2 shows the SEM micrographs of pure polypyrrole and 5wt% polypyrrole:polystyrene. Pure polypyrrole shows agglomerated uniform granules structure having some pores that might be because of the fast evaporation of the solvent, which might be useful for gas sensing application. However the blend of PPY:PS shows non uniformity with wrinkled surface and leaving some open area of the composite [10]. PPY nanoparticle seems to be deposited onto the PS surface with increase in the doping concentrations of PPY along with the clusters located between the PS matrix. In addition a uniform flowerlike architecture has been found to grow with increase in the doping concentrations. A close observation reveal that flower was composed of dozens of flake like nanopetals [11,12].

**Conclusion:** Free standing films of PPY:PS composite has been prepared by solution casting method. Surface morphology clearly reflects flower like morphology in the images of PS matrix

### References:

- [1] Zhu B.J., Wei S., Alexander M.J., et al.. Adv. Funct. Mater. 20 (2010) 3076–3084.
- [2] Zhu J., Wei S., Ryu J., et al., J. Mater. Chem. 20 (2010) 4937–4948.
- [3] Zhu J., Wei S., Chen X., et al. J. Phys. Chem. C (2010) 8844–8850
- [4] A. Kassim, Basar ZB, Mahmud HNME. Proc Indian Acad. Sci. (Chem. Sci.). 2002 Apr; 114: 155-162.
- [5] Henry, F.; Costa, L.C. Micro. Opt. Techn. Let. 2005, 45 (4), 335–337.

- [6]. Adhikari, B.; Majumdar, S.. Prog. Polym. Sci. 2004, 29 (7), 699–766.
- [7]. Hosseini, S.H.; Ali, A.E. J. Appl. Polym. Sci. 2003, 90 (1), 49–62.
- [8] Ruckenstein, E.; Park, J.S. . Polym. Compos. 1991, 12 (4), 289–292.
- [9] Hemant K. Chitte, Narendra V. Bhat , Vasant E. Walunj and Ganesh N. Shinde Journal of Sensor Technology 1, 47-56 (2011).
- [10] Subhendu Bhandari, Nikhil K. Singha and Dipak Khastgir, Chemical Engineering Journal 313, 1302-1310 (2016).
- [11] Hassan Ghalib ,Ibrahim Abdullah and Rusli Daik, Journal Polymer - Plastics Technology and Engineering 52, 478-484 (2013).
- [12] Linping Xu, Yun-Shuang Ding, Chun-Hu Chen, Linlin Zhao, Claire Rimkus, Raymond Joesten and Steven L. Suib, Chem. Mater 20, 308-316 (2008).

