# The executive summary of the final report of work done on the Minor Research Project under XI$^{th}$plan of U.G.C.

**Title of research project-**Synthesis and Characterization of Conducting Polymer-Metal ion Nano-composite

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- **Installation of Laboratory set up**

**i)**UV light chamber with varying intensity (8W, 16W, 24W, 32W).

**ii)**A Screen printing Unit (manual) used for preparation of thick films.

**iii)** Low temperature Static gas sensing unit. It consist sensing chamber with varying temperature facility, temperature sensor, temperature indicator, gas shower, variable power supply (0-30V; 5amp) and digital picoammeter.

- **Synthesis of $WO_3$/polyaniline and O-anisidine/Ag composites as the sensor elements:**

In the present work, Polyaniline-$WO_3$ compositewere prepared for different weight percent of $WO_3$ (25, 50, 75 wt %) using simple chemical polymerization process. Also Poly(o-Anisidine)-Ag nano-composite samples were prepared with photo induced polymerization method.

The thixotropic pastes of the fine powders were formulated by mixing the synthesized fine powder samples with a temporary binder solution. The pastes were screen printed on glass substrates in desired patterns [16, 17]. Thus the sensor elements with different wt % of $WO_3$with polyaniline and Poly(o-Anisidine)-Ag nano-composite sampleswere obtained.

These gas sensing elements are then characterized by UV-Visible spectroscopy, X-ray diffraction FTIR, SEM-EDAX techniques.

- The aim of the present work is to develop the sensor by modifying Polyaniline and it`s substituted derivative o-Aniside, which could be able to detect the toxic gases at trace level.

From the results obtained, following statements can be made

1. Pure PANI was almost insensitive to LPG and LNG gases.
2. 50 wt % of $WO_3$ incorporated in pure PANI is the most sensitive element to LPG gas at $325^0$C.
3. The polyaniline-$WO_3$sensor element showed very rapid response and recovery to LPG gas.
4. The polyaniline-$WO_3$sensor element has good selectivity to LPG against $NH_3$, $CO_2$, $Cl_2$, $H_2$, $H_2S$ and $C_2H_5OH$.
5. Photo induced polymerization results incorporation of nano size Ag on the o-Anisidine matrix.The average particle size of Ag is about 5.8 nm.
6. Thick film samples of Poly(o-Anisidine)-Ag nano-composite exhibits maximum response of LPG at ($75^0$C).
7. It shows good sensitivity. Remarkable selectivity for LPG against various gases, fast response and rapid recovery.Poly(o-Anisidine)-Ag nano-composite would be a good candidate for application as LPG sensor at considerably low temperature.