1.0 ABSTRACT
In this research work, conductive polymers/DNA (CP-DNA) composite nanowires were chemically synthesized using a simple and low cost fabrication method by employing DNA as a template on which to carry out the polymerization. Their chemical (FTIR, UV-vis and XPS), morphological (AFM and TEM) and electrochemical conductivity (two-terminal CV characterization measurement) and volatile organic vapor sensing test were carried out investigated.

2.0 INTRODUCTION
Gas sensor networks have a wide variety of applications in environmental and safety monitoring that can be very useful to businesses and the general public. However, gas sensor technologies are still developing and have yet to reach their full potential in capabilities and usage [1]. Scientific and technological communities globally have great interest on materials that can form well-defined materials on the nanometer scale. Conducting polymers (CPs) are unique materials because they exhibit electronic, magnetic and optical properties of metals and semiconductors while retaining the attractive mechanical properties and processing advantages of polymers [2]. Oxidative polymerization in DNA-containing solutions resulted in thin, homogeneous and uniform nanowires because the cationic oligomers are strongly attracted to the anionic sulpho-phosphate backbone of DNA molecules. [3]

3.0 Polymerization of CP in DNA containing solutions

4.0 Proposed mechanism of self-assembly of DNA/CP nanowires

5.0 CHEMICAL CHARACTERIZATION
5.1 XPS Studies
Figure 1. Core level XPS spectra of CP-DNA: (c) survey scan, (b & d) C 1s spectra and (a) N 1s spectrum

5.2 FTIR Studies
Figure 2. FTIR transmittance spectra of PlnDNA-DNA absorbance (∆A) of DNA (black), PlnDNA (red) and DNA absorbance (green) and the difference spectrum (PlnDNA-DNA) - peaks. (b) spectra recorded and analyzed. (c) SPR polarizations. Samples solution (2ml) were deposited on a clean glass slide (25 X 75 mm) and dried to air for 1 hour prior to analysis. A clean glass slide served as the background. The spectra are offset for clarity.

6.0 MORPHOLOGICAL CHARACTERIZATION
6.1 AFM Studies
Figure 3. AFM images of CP-DNA: (a) tapping mode AFM images of CP-DNA. nanowires showing single (b) and clusters with smooth, regular morphologies

6.2 TEM Studies
Figure 4. TEM images of CP-DNA nanowires after more than 24 h reduction time, showing large scale network structures and enlargement of the nanowires

7.0 ELECTRICAL MEASUREMENT
Figure 5. Current-voltage (I-V) curves of a bare-probe contact CP-DNA film. Figure 6. I-V characteristics for the Conductance of a nanowire transistor at a temperature range from 300 K to 380 K. (Inset B) I-V characteristic for the Conductance of the nanowire, measured at 25 K, 250 K, 300 K, 350 K and 380 K.

8.0 Gas Sensing Test
Figure 7. Schematic diagram of the laboratory flame cupboard gas sensing set up

9.0 CONCLUSIONS
- The FTIR and UV-vis spectra of the product material provided evidence of the formation of a supramolecular hybrid polymer containing 3-DNA and conductive Polymers.
- AFM and TEM images before and after templating show a smooth and uniform morphology along their length. An increase of the average height from 1 nm to 20 nm after templating with FeC3 was also observed.
- XPS survey spectra of CP-DNA samples revealed the presence of the elements C and N in addition to Cl, O and P (which indicated the presence of DNA).
- No signature of the presence of iron was observed in the survey spectra which confirm that the FeC3 was used only to drive the polymerisation without any oxidative damage to DNA.
- The current -voltage (I-V) data obtained shows that the nanowires are electrically conductive.
- Repeatability in response characteristics at room temperature of CP-DNA sensors to vapors of different volatile organic vapors in air, reveals the possibility of the nanowires to be good sensor materials.

10.0 FUTURE WORK
- Sensitivity studies with different analyte saturated vapors
- Understanding the conduction mechanism
- Organic vapour combination that will works best
- Sensing test at variable temperature

11.0 REFERENCES

12.0 ACKNOWLEDGMENT
- Benjamin Horrocks
- NUS Tekon, Nigeria
- ToProf. Ibrahim