This research proposed study on new nanocomposite material for the application of electrical devices, which utilized fluoropolymer and nanofiller. Nanocomposite thin films with MgO loading percentages of 1, 3, 5, and 7% incorporated in PVDF-TrFE polymer matrix were produced by spin coating technique on Al-glass substrates. The PVDF-TrFE thin films were annealed and recrystallized in accordance to the transition temperatures (Tc, Tm and Tcrys) of PVDF-TrFE determined through the observation of the DSC spectra. The annealed PVDF-TrFE thin film (AN113) showed significant improvement in the ferroelectric properties with rectangular shape hysteresis loops for a range of applied voltage. Most importantly, the annealed AN113 film sustained electrical breakdown unlike the recrystallized thin films (RC154, RC135 and RC55). The \( P_r \) value recorded for AN113 thin film at applied voltage of 100 V was 77 mC/m\(^2\), with \( E_c \) of 88 MV/m. The morphology of AN113 thin film was also observed to be defect free, as evident from FESEM images. The high intensity peaks at 1288 cm\(^{-1}\) and 845 cm\(^{-1}\), observed from the FTIR spectrum showed most of the dipoles in AN113 thin film were aligned parallel to the b-axis. Further annealing of PVDF-TrFE thin film at 120°C (AN120), showed a significant increased in the \( P_r \) to a value of 93 mC/m\(^2\) and \( E_c \) of 74 MV/m at 100 V applied voltage. With the incorporation of MgO nanofiller in PVDF-TrFE, the AN120/3%MgO nanocomposite thin film showed the highest \( P_r \) of 88 mC/m\(^2\) with \( E_c \) of 79 MV/m at 100 V, relative to the \( P_r \) and \( E_c \) values obtained for nanocomposite thin films filled with MgO at loading percentages of 1, 5 and 7%. Further increased in MgO loading percentage, produced a drop in crystallinity, as shown by the decrement in the XRD peak diffraction patterns at \( 2\theta = 19.2^\circ \). It is noteworthy to mention that from the observation of the XRD peak diffraction patterns, peak at \( 2\theta = 17.5^\circ \) emerged for AN120/5%MgO and AN120/7%MgO films, which indicated the presence of a phase crystals in these nanocomposite films. These unfavourable non-polar crystals have little contribution to ferroelectric properties of the nanocomposite thin films. Therefore, it is established in this study, the favourable thin film produced with enhanced ferroelectric was the annealed PVDF-TrFE thin film at 120°C and loaded with 3% MgO nanofiller.

Plastic have many advantages including good water resistance, ease of processing and low cost. The problem with plastic bag is that, it has great environmental impact as millions of plastic wastes were discarded. Polybag for example can take up from 500 to 1000 years to decay or degrade in agricultural farm which can create serious environmental pollution. The purpose of this study was to investigate the degradable properties of Liner Low Density Polyethylene (LLDPE) filled with Sago SS (SS) and Polyvinyl Alcohol (PVOH). Two processing stage were performed in this research. The first stage covers the preparation and testing on properties of Hybrid Master Batch (MB) film of SS/PVOH formulation. Hybrid MB films were formulated by varying ratios of maximum SS/PVOH of 70%. The second stage covers the preparation and testing of Hybrid Blend Film (BF) of SS/PVOH. For the first stage, combination of LLDPE, SS and PVOH first compounded using twin screw extrusion and fabricated into Hybrid MB films with fixed amount of LLDPE with SS and PVOH varies between 10% to 60%. The Hybrid MB films then test for their tensile properties (ASTM D-1780), Water Absorption (ASTM D-570-95) and Thermal Properties (ASTM D 3418) and Biodegradability (ASTM D5338-98). Tensile properties test shows that increasing the amount of SS in LLDPE films will reduce the tensile strength of the blends as Hybrid MB A exhibited the highest tensile strength of 6.7 MPa while lowest strength was found for Hybrid MB E of 5.1 MPa corresponding to highest starch content of 60% and PVOH 10%. Increasing water absorption of Hybrid MB films were observed with increasing of SS amount in SS/PVOH formulation. Degradability of Hybrid MB films after soil burial for 30 days were observed to be increased with increasing amount of SS due to enzymatic attack of microorganism on the film. DSC result had shown films filled with higher amount of SS exhibited reduction in the melting temperature of the blends. For second stage experimental, Hybrid BF were fabricated using film blowing extrusion and formulated employing 10% Hybrid MB with PE resin and then tested for Carbon Dioxide (CO2) Measurement (ASTM D 6400), Soil Burial (ASTM D 5338-98), Fourier Transform Infrared Spectroscopy (FTIR – ASTM 1252-98) and Scanning Electron Microscope (SEM). Hybrid blend films were exposed to free Carbon Dioxide atmosphere for 45 days, whereas Soil Burial test was carried out for 1 year. Increasing SS amount on LLDPE films also increase the Carbon Dioxide generation by microorganism after 45 days. From FTIR spectrum displayed after 360 days of degradation, the intensity of the peaks significantly decreased and broadens at peak 3302, 1462, 1261, and 1020 cm\(^{-1}\)due to OH and C-O bend as a result from degradation of SS by microorganism. Morphological structure of Hybrid BF was viewed using SEM showing that after 360 days of degradation, there was a lot of detachment of SS from LLDPE matrix as degradation has taken place in the blend films. Hybrid BF A which has 20% of SS exhibits only 3% of CO2 generation compare to Hybrid BF E which contain 60% of SS display more active decomposition activity of 12% CO2 generation. The optimum filler content was found to be 60% (Hybrid E) which drop in mechanical properties showing high degradability occurred. This is a useful formulation for bio degradable polybag bags and agricultural mulch application.