**Experiment 3: Detailed Timeline Analysis Carbon Black Enhancement Performance Validation** Modified (10% CB+SSM) 150 SSM (Pristine) Modified Peak: 160.8V at 154h SSM Peak: 106.3V at 154h 125 100 **Noltage (V)** 50 25 -25 -50 0 50 100 150 200 **Performance Advantage Analysis Equal Performance** Modified Advantage 60 SSM Advantage 40 Voltage Difference (V)

[Modified - SSM]

-70

-40 **-**40 -60 -80 50 100 150 200 **Relative Performance Ratio Analysis** 2.0 1.5 Performance Ratio [Modified / SSM] 0.0 -0.2 **−−** • Equal Performance (Ratio = 1) Modified Superior -1.5 SSM Superior 200 100 150 Time (Hours)