We demonstrate the controlled chemical functionalization of polymeric and carbon-based particles using two types of table-top plasma technology: These are vacuum and atmospheric-pressure (ambient) polymerization discharges operating in a range of monomers and monomer-gas mixtures. The degree of functionalization is determined using a suite of analytical techniques, such as XPS and FTIR for species identification and zeta potential measurements to determine the surface charge. Two particulate materials are highlighted, mono-dispersive 830 nm polystyrene nanoparticles for applications in drug delivery and graphene platelets for advanced composites. Chemistries deposited include carboxylic acid and amine containing groups. The background of the plasma polymerization methodology for particle modification is discussed.