Prebiotic macromolecular carbonaceous material with a significant organic component has long been known in certain meteorites and suspected on the surfaces of Solar System bodies. Improved remote sensing and in situ measurements have revealed spectral signatures of specific organic chemicals (in some cases) and basic molecular classes (e.g., aliphatic and aromatic) in the surface materials on comets, planetary satellites, and Kuiper Belt objects. Here I focus on recent results from the Cassini VIMS (near infrared) science investigation in the Saturn system and on developing results from the Spitzer Space Telescope (mid- and far-infrared). Cassini-VIMS reveals organic solids on the surface of Titan where a dynamic chemical system involving the subsurface, surface, and atmosphere occurs. Organic molecules are seen in the eruptive plumes of Enceladus and on the satellite’s surface. The low-albedo, red-colored material on Phoebe and Iapetus carries spectral signatures of aromatic molecules and possibly aliphatic molecules, while the low-albedo material on Hyperion has a more ambiguous composition. Among the Centaur objects and Kuiper Belt objects, ices of methane, ethane, and methanol have been detected, in addition to water ice, but most of these objects have imperceptible spectral features. In many cases, the strong red coloration of their surfaces suggests the presence of complex organic material that can be modeled with tholins, which are synthetic macromolecular organic complexes made from energetic processing of simple reducing gases and ices. The relationships of all these solid organic materials and comparisons with insoluble organic matter in meteorites and the lab are explored.