Plasma, according to natural science, comprises the 4th state of matter next to the solid, liquid and gaseous state. Ionizing a gas leads to the formation of plasma, having conductive properties due to the charged and excited species present. The relaxation of excited species is responsible for the typical glow discharge associated to the widely known applications in lighting and audiovisual industry.

The general intention of plasma polymerization is to produce ultrathin, pinhole free, highly cross-linked and thermally stable polymer-like films. Over the last century, scientists and engineers have contributed to the advances made in plasma polymerization, but without thorough understanding of disciplines other than their own. Consequently, analysis of phenomena and material properties has been restricted by the disciplinary background of the investigator, leaving the plasma polymerization process more or less like a black box.

This book is intended to cover fundamental knowledge in the structure-processing-property relationships of plasma deposited methacrylate-like thin films in an atmospheric dielectric barrier discharge reactor. Using calorimetry, clear correlations were found between the glass transition and residual reactivity of the thin plasma films and the various external plasma processing parameters, such as input plasma power and precursor mass flow. Also the effect of substrate temperature on the plasma deposition kinetics and thermal properties of the plasma film is investigated in this book.