Summary

This thesis reports the extensive investigation on the formation and characterization of 3C silicon carbide, derived by a wet chemical sol-gel based method and carbothermal reduction. It is shown, that this alternative preparation delivers highly pure 3C-SiC for different fields of application, where SiC is of high interest, due to its outstanding properties. Especially for electronics, highly pure and defect free crystals are needed, but costly and hard to prepare with conventional methods. Here beside nano- and microcrystals, as they are obtained in most known SiC sol-gel processes, the preparation of monocrystalline microwires and monocrystalline thin films is presented. Another result, but based on the same start material, in the transformation of carbon objects into silicon carbide. Thereby any type of carbon, such as graphite or glassy carbon can be converted into SiC without deforming or shrinking. Two different types of porous silicon carbide have been obtained, with random or regular pores. The random type with its tuneable pore size is useful for filtering or catalyst support, but also for electronics due to its luminescence. SiC with regular monodisperse spherical pores on the other hand, has been obtained by infiltration of a carbon opal template. All these SiC material types presented above can be doped easily. On this way even those dopants have been introduced, which have been impossible with other methods beside ion implantation. The process offers a couple of possibilities for controlling and therefore space for optimization. At the current stage of development the described sol-gel SiC process in this thesis cannot replace all classical preparation methods for SiC, but shows some alternative possibilities.