Carbon nanostructures are a wide field with many applications. The use of carbon nanostructures as support in heterogeneous catalysis is a key development that led together with the use of nanoparticles to a significant cost reduction of catalysts. Catalysts designed in this way are widely applied in fuel cell technologies. For portable devices especially low temperature fuel cells are desirable with low hazards for the user. One technology which fulfills these requirements is the direct formic acid fuel cell (DFAFC). DFAFC have many promising characteristics, high electromotive force and easy fuel handling. However, they still suffer from too low power output and lifetime for commercialization. This thesis focusses on two main aspects: the synthesis of carbon nanostructures by chemical vapour deposition (CVD) and their application as catalyst support. The materials are investigated by many different techniques ranging from transmission electron microscopy (TEM) to fuel cell tests.