Abstract

Considering the sustainability and scarcity of the precious metals, the focus of this thesis was the development of new volatile compounds for the fabrication of nano-scaled metal films. Therefore, heteroleptic precursor concepts based on enaminones and heteroarylalkenols with carbon monoxide (CO), 1,5-cyclooctadiene (COD) and methyl ($–CH_3$) were introduced as coligands to synthesize molecular compounds with subvalent Mn(I), Re(I), Ru(II), Ir(I) and Au(III) as central atoms. The received precursors have a high volatility (≤100 ·C, 10^{-2} mbar) and the compounds were fully characterized by 1D and 2D NMR, IR-, UV/Vis spectroscopy, EI-MS, CV and DFT calculations as well as single crystal structure analyzes. The hemilability of the enaminone ligands at the rhenium complexes was tested in homogeneous catalysis (*Friedel*-*Crafts* alkylation) and the compound [$(CO)_3$Re(TFB-MPA)] shows a high selectivity of ~100%. The rhenium precursor [$(CO)_3$Re(TFB-DMPDA)] was deposited via MO-CVD and magnetic field-assisted CVD (MF-CVD), respectively. By the characterization methods XRD, XPS, SAED and SEM, the influence of the external treatment with a magnetic field on the material properties was proven. The tailored precursor design enables the synthesis of rhenium nitride (ReN) based on *Single*-*Source*-Precursors for the first time. The analogous manganese derivatives tend to form MnO during the thermal decomposition, due to different affinities (M-N and Mn-O, M = Mn and Re, HSAB concept) and indicate the potential to be suitable as CVD precursors for the formation of manganese oxides. Due to the low deposition temperature the Ir(I)-precursor [(COD)Ir(DMOTFP)] yields an amorphous composite material consisting of Ir/IrO_2 by the PE-CVD method. After annealing, phase-pure crystalline iridium(IV) oxide was obtained. In this work, a unique square pyramidal gold hydrate [Me_2Au(PyTFP)] · H_2O was synthesized and transformed into nanoparticulated gold via MO-CVD. In this work, controlled material synthesis was conducted and the impact of the molecular structure onto the phase composition as well as chemical purity of the target material was clearly shown.