THESIS I.

I prepared low permeability poly(dimethyl siloxane) matrix composites (abbreviated as HyPoMaC). I proved with scanning electron microscopy (SEM) that by using a proper processing technology it is possible to develop structural anisotropy by orienting the filler particles. The structural anisotropy is accompanied by magnetic anisotropy. I observed that an interphase can be defined between the filer and the matrix, which may result in a crust formation around the filler particles.

THESIS II.

Based on Vibrating Sample Magnetometric (VSM) studies of HyPOMaC I showed that the matrix provides proper stability for the filler particles to achieve a magnetic stability of the composite magnets even in the long run (exceeding 2,5 years) against their own demagnetizing force. I also proved that the processing technology of HyPoMaC may influence the magnetic properties of the fillers through changing their chemical composition and particle size. I also proved that it is possible to create HyPoMaC permanent magnets.

THESIS III.

I demonstrated that the specific saturation magnetization of HyPoMaC depends primarily on the degree of filling, i.e. of the ratio of the components, the specific saturation magnetization values of the components should be weighed by their mass fraction. I proved that the composites can be identified with 25% margins. Based on the filling factor and on the VSM test the calculated specific saturation magnetization values exhibit less that 8% deviation from the measured values.

THESIS IV.

Based on the tensile test results of HyPoMaC I demonstrated that the presence of fillers reduces the tensile strength of the matrix. When using the filler EFI the tensile strength deceased linearly wit the filling factor in the 0-0,75 range.

I also demonstrated that, as a function of the filling factor the composites exhibit a transition range with respect to the matrix. The composite shows the minimum tensile strength in this range.

THESIS V.

Based on dynamic mechanical (DMA) tests, analyzing the maxima of loss factors below 273 K I observed that the maximum loss value decreases with filling and the position of the maximum shifts to the negative direction with increasing filling.

THESIS VI.

I developed a new test method to determine the initial magnetic permeability of low permeability elastic materials based on magneto-resistance. I analyzed the advantages and drawbacks of the test method. I described the calibration and evaluation method of the new test method.