Zinc is nowadays one of the nonferrous metals with the highest consumption in the world. More than 13 million tons are produced annually, causing up to 9 million tons of residues every year. Investigations on different dumps, especially in Europe, have shown that these residues contain considerable amounts of different valuable metals, particularly zinc, lead and silver. In connection with the global search for new resources these by-products are getting more and more interesting. A pyrometallurgical treatment concept developed at the University of Leoben could realize the combined winning of different metals in one process. However, a prior enrichment by means of beneficiation would increase the efficiency considerably. In order to adapt and develop appropriate techniques, a detailed characterization of the material is of prime importance. In cooperation with different partners from industry, the development of a process of characterizing and processing different metallurgical by-products (actually from hydrometallurgical zinc production) is in the focus of a multi-institutional research project at the University of Leoben. Especially in the described field of precipitation residues from zinc industry, first important steps have been made regarding the determination of present compounds and their morphology. Detailed work is currently done on the minor metals present in the material, like e.g. silver, to identify, in which compounds they can be detected and with this to which other metals they are associated. These findings would allow to define further possible processing to concentrate the valuables and make the subsequent metallurgical recovery more efficiency.