

Preface

For industrial applications, the designation “cermets” is used for TiC- and Ti(C,N)-based composite materials with a Co- or Ni-based binder phase. In this respect, they compete with cemented carbides (hardmetals) which are WC-Co-based materials. While the latter are relatively simple with respect to basic metallurgy, cermets are rather complicated because of their multi-component nature and the fact that the occurring microstructures upon sintering are not in thermodynamic equilibrium.

However, there is an increasing interest in Ti(C,N)-based cermets for various cutting applications (turning, milling drilling and sawing, both metal and non-metal type of materials), as well as applications in electronic industry. The great potential of tailoring the material properties is due to an almost inexhaustible variability of principal formulations together with a broad variety of available hard-phase powders with different alloy status and grain sizes. Also, the binder phase can be changed to a large extent without losing the principle structure and properties. A substantial goal in these efforts is certainly the increase of fracture toughness to decrease the brittleness of cermets. A further benefit of cermets is a rather uncomplicated supply chain of raw materials. Because of geostrategic peculiarities and the distribution of mines around the world the raw material supply risk for cermets is lower as compared to tungsten-based systems.

The present production of cermets is only at around 5% of total cutting tool production in the Western hemisphere, but Japan with a production level of around 25% has shown that this figure can be extended substantially. This will certainly increase when conventional near-net shape production develops further and new production technologies such as additive manufacturing are established. Parts from such technologies, often much smaller and lighter than conventional large machine parts, require “only” finishing operations for which cermets (together with ceramics) are the first choice.

The present collection of papers should give insight into to complicated but rather interesting nature of cermets together with ongoing research and application. The papers stem from the most important laboratories which fruitfully have enlarged and are still enlarging the knowledge in this field. Innovations in material composition which have already triggered their application stem from these research sites, too.