



Professor **Mikolaj Szafran**, PhD, DSc., Eng.  
Warsaw University of Technology  
Faculty of Chemistry  
Department of Chemical Technology

## **Chemistry in technology of advanced ceramic materials**

### *Abstract*

The lecture will be focused on the presentation of own research concerning the design of advanced ceramic materials with the use of knowledge and achievements from organic chemistry, chemistry of polymers and colloids. The research on the influence of amphiphilic polymers (in the form of aqueous dispersions) on the properties of ceramic samples obtained by pressing and tape casting methods will be discussed. The research showed that the important role in the preparation of high-quality ceramics plays the ratio of the length of hydrophilic to hydrophobic part of the polymeric chains.

The following part of the lecture will be devoted to the research on the use of enzymatic decomposition of selected substances on the pH change around particles in ceramic suspensions, leading to the coagulation of ceramic slurry and thus the formation of the green body. The next topic within the lecture will concern deagglomeration of ceramic nanopowders with the use of mono-, di- and oligosaccharides and their derivatives. The experiments show that the chemical structure of saccharides has the significant influence on the rheological properties of nanoceramic slurries. Next, the research on the synthesis and application of new water-soluble organic monomers on the basis of mono- and disaccharides in the fabrication of ceramic materials by gelcasting method will be discussed. Gelcasting allows to obtain ceramic elements of complex geometry from many materials such as oxides, nitrides, carbides, etc. The lecture will be also focused on the ferroelectric ceramic-polymer composites as new materials for tunable and elastic microwave sensors as well as materials based on shear-thickening fluids used in energy absorption.