Name	Title of the research topic	Description of the research topic	Student
Dr. Benke Márton	Prediction of mechanical anisotropy of BCC metals from pole figures	A method has been developed at the University of Miskolc to predict the mechanical anisotropy, nanmely, earing of aluminum sheets from the data of pole figures. The objective of the PhD topic is to further develop the method to make it suitable to predict the mechanical anisotropy (earing, Lankford-value) of cold rolled and annealed sheets of metals with BCC crystal structure based on pole figures. For the topic, the knowledge of the principles of crystal anisotropy and its X-ray diffraction based measurement method is favoured.	1
Dr. Benke Márton Dr. Mertinger Valéria	Formation of residual stress after various machining operations	The residual stress state that is induced by the machining processes plays important role in determining the service life of the machined component, depending on its magnitude and sign. As an example, the existence of tensile residual stresses will increase the chance of crack forming nucleation and propagation, leading to a reduction of the fatigue life, corrosion, and wear resistance. The final residual stress state in any machined component depends, mainly, on the material of that component and on the cutting and turning parameters that have been applied during the process, like cutting speed, cutting feed, tool nose radius, depth of cut, kind of cutting	1
Dr. Diószegi Attila	On the morphology and defect formation mechanisms in automotive cast iron alloys	Cast iron is one of the most environmentally friendly technical alloys used for complex automotive applications with respect to the production process and lifetime application. The material is fully recyclable, which contributes to a low environmental footprint. The sophisticated production process for cast iron, including melting, casting and solidification contributes to a variation of the material properties and may cause defect formation in the bulk material. The present topic aims to study the influence of morphology and casting defects on the final properties off cast iron. State of the art instruments and methods will be used to perform the research work	1
Dr. Fiser Béla	Molecular Design and Synthesis of “Green” Polyurethanes	Polyurethanes are made by reacting di-, oligo- or polyisocyanates with polyols to produce different materials (e.g. heat insulators). The starting materials used for conventional polyurethanes are raise severe health and environmental concerns. Thus, intensive research and development has been carried out to prepare environmental friendly (“green”) polyurethanes. The implementation of this project includes a series of computational and experimental steps to design	1

Dr. Géber Róbert Dr. Simon Andrea	Waste-to-resource preparation of geopolymers containing glass foams derived from hazardous glass waste	The multifunctionality of different glass types has led to an increasing amount of waste glass. Technological developments have resulted a significant growth in the consumption of computers and televisions. However, most of this type of waste was made up of cathodic ray tubes and screen glasses containing some hazardous elements (Pb, Sr, Ba). Disposal of these wastes is harmful for the environment. As it is difficult to remove CRT lead for recycling, one possible way to neutralize the harmful chemical compounds is the encapsulation. In this research, geopolymers containing glass foams derived from hazardous glass waste are developed. Geopolymers are mainly derived from waste materials (e.g. fly ash, construction and demolition waste, red mud etc.). Glass foams are prepared by using CRT waste glass. These glass foams will be added as a lightweight aggregate to the geopolymer paste to produce lightweight geopolymer concrete. Microstructure, chemical and mechanical properties of the newly developed materials will be characterized	1
Dr. Gergely Gréta Prof. Dr. Gácsi Zoltán	Development and investigation of solder nano composites (SAC + nano SiC) (FIB-SEM).	The topic covers development of different kind of solder based composite materials. PM and reflow technics are available. For investigation purposes the novelty techniques are provided.	1
Dr. Gergely Gréta Prof. Dr. Gácsi Zoltán	Investigation the effect of life cycle influencers on solder joints (examinations of solder joints by CT and FIB SEM).	The scientific area involves special, unique test methods, which are able to give a full scale caharacterization of the effect of life cycle influencer parameters.	1
Dr. Gergely Gréta Prof. Dr. Gácsi Zoltán	Development of titanium-based composites by powder metallurgy (milling, pressing, sintering) and examination of their structure (CT, FIB SEM)	PM method and pre-milling process provides good chance to develop novelty Ti-based composites with the variations of process parameters. New, special examination techniques are available for the investigations.	1
Prof. Dr. Gömze A. László	Investigation the effect of transition metal impurities (Fe, Cu, Co, Mn) on the major properties of BaTiO3 ceramics	The aims of this PhD research are the examination and investigation of influence and effect of the transition metal additives (like Fe, Cu, Co or Mn) on the morphology, microstructure composition, dielectric, piezoelectric and ferroelectric properties of BaTiO3 functional ceramics. The influence of temperature and relations between the used technological methods of preparation and the crystalline structure, dielectric, piezoelectric and ferroelectric properties of BaTiO3 also must be examined and studied	1

Prof. Dr. Gömze A. László	Development and investigation of structures and properties of MgO stabilized ZrO2-Al2O3 porous ceramic composites	The aims of this PhD research are the development, examination and investigation of nano-structured hetero-phase ceramic composites using MgO stabilized ZrO2 and Al2O3 components. This research work must be focused on studies of the effect of the phase composition, ZrO2 and Al2O3 nano-particles concentration and distribution on mechanical stress relaxation and dissemination. The relations between mechanical strength, fracture toughness, porous and crystalline structure of these composites also must be examined and studied.	1
Prof. Dr. Gömze A. László	Development nanostructured ceramic composites based on titanium and aluminum oxides	The aims of this PhD research are the investigation and development of new nanostructured ceramic composites based on titanium and aluminum oxides. The research work must be focused on examination of mineral compositions and physical, chemical and technological properties of alumina and titanium dioxide powders and their application in development of Al2O3-TiO2 based technical ceramics, composites and the functional materials.	1
Prof. Dr. Gömze A. László	Development and investigation of alumina matrix ceramic composites reinforced with SiAlON, Si3N4 and Si2ON2 nanoparticles	The aims of this PhD research are the development and investigation of new nanostructured ceramic composites based on aluminum oxides. The research work must be focused on examination of material compositions and physical, chemical and technological properties of alumina oxide powders and their application in development of Al2O3 based technical ceramics and composites reinforced with SiAlON, Si3N4 and Si2ON2 nanoparticles.	1
Prof. Dr. Gömze A. László	Development modeling and comparison of morphological and mechanical properties of composite materials reinforced with woven and knitted fabrics	The aims of this PhD research are the investigation and development of new laminates and ceramic composites reinforced with woven and knitted fabrics. The research work must be focused on examination of morphological compositions and physical, chemical, mechanical and technological properties of the used matrix and woven and knitted reinforcing materials and their relationships to the mechanical and physical properties of the developed composites	1
Prof. Dr. Kaptay György Dr. Baumli Péter	Development of metallic materials with high internal specific surface area	Particle reinforced composite materials, (nano) laminar materials, foams and emulsions (stabilized by solid particles or not) are high interfacial area materials. This class of materials has a very large variety of matrix / reinforcing / stabilizing phases and a high variety of potential applications. The goal of research studies under this general subject is to develop new high interfacial materials, study their properties as function of composition and technological parameters and to study basic criteria of their successfull production. Applicants are invited for PhD studies in any specific part of this wide field.	1

Prof. Dr. Kaptay György Dr. Baumli Péter	Fabrication and characterization of nano multi-layered materials for low temperature brazing applications	Engineered nano multi-layered materials (NML) exhibit promising applications in contemporary brazing technologies. The use of NML in joining introduces melting point depression which is the ability to achieve the desired effects with decreased temperature range using traditional brazing techniques. NML have the potential to increased thermal flow and interface formation thus also reducing the reaction time. NML films are fabricated in alternate layers of metal and chemically inert barrier in nano scale using sputtering techniques. In the proposed study fabrication of brazing filler composed of Ag, Cu, Ag-Cu and other metal alloys with different inert barriers and their applicability as brazing materials will be studied. The prepared layers will be characterized using techniques including XRD, SEM and TEM to study their microstructure in the interface and bond formation.	1
Prof. Dr. Kaptay György Dr. Baumli Péter	Development of new aluminum-matrix composite materials reinforced with nanoscale refractory particles	Particle reinforced composite materials, (nano) laminar materials, foams and emulsions (stabilized by solid particles or not) are high interfacial area materials. This class of materials has a very large variety of matrix / reinforcing / stabilizing phases and a high variety of potential applications. The goal of research studies under this general subject is to develop new high interfacial materials, study their properties as function of composition and technological parameters and to study basic criteria of their successfull production. Applicants are invited for PhD studies in any specific part of this wide field.	1
Prof. Dr. Kaptay György	Development of Calphad and nano-Calphad	PhD applicants are invited to develop further the modeling of bulk and interfacial thermodynamics of mostly metallic materials, including the Calphad method.	1
Prof. Dr. Kékesi Tamás	Purification of chloride solutions by anion exchange for the extraction of high purity metals	Preparation of high purity metals, mainly required by the modern electronic industry, is aimed by hydro-electrometallurgical methods, that are economically feasible at low scales and with low investment. The aqueous chloride waste solutions obtained from industrial technologies or model solutions prepared by chemical or anodic dissolution can be purified by selective methods of ion exchange and/or precipitation. The possibility of purification must be based on equilibrium anion exchange distribution studies. The elimination of the impurity metals has to be verified and optimized by the results of anion-excahnge chromatographic elution experiments. High purity metal is obtained by direct electrowinning or hydrogen reduction after evaporation to dryness. Efficiency of the process should be enhanced by optimizing the composition and the redox conditions of the aqueous media.	1

Prof. Dr. Krállics György	Modelling of sheet metal rolling in macro and micro level	The research topic is to develop relationship between the technological parameters and the mechanical behaviour rolled metal. The work consists of finite element process modelling, with the microstructural changes, experimental part on the rolling mill and investigation of the microstructure and the mechanical properties of tested material. Deformability of the materials, damage during the rolling and the strain induced anisotropy also investigated	
Prof. Dr. Krállics György	Roll bonding of metallic sheets	The research topic is developed the technological basis of roll bonding of metallic sheet. For this goal :Make a literary review of the physical and mechanical processes of cold and hot roll bonding. Develop a mathematical model for rolling and bonding processes of multilayer material. Use the finite element calculation for the numerical realization of the model.Perform rolling experiments to produce sandwich structures with different thickness layers for hot and cold rolling of different material pair. Examine the effect of surface preparation on the quality of the bond. Analyse the bond strength of the rolled material and the factors influencing it. Compare the results of experiment and finite element modelling of roll bonding.	
Prof. Dr. Mizsey Péter	Interated process design under consideration of environmental protection and control, CO_2 capture	The subject is complex, where the process design is studied under consideration of energy and mass integration possibilities moreover the controllability features, too. The subject of the research is to develop a process design strategy which includes these features and uses the tool of mathematical modelling. The research includes also the investigation and development of the Carbon Capture and Utilization technologies	1
Dr. Németh Zoltán	Synthesis, characterization and functionalization of graphene composite nanostructures for adsorptive remediation of wastewater pollutants	Pollution of air, water and soil is a worldwide issue for the eco-environment and human society. In the present PhD work we will propose a comparative study between different nanostructured materials to investigate their ability in removal of heavy metals from wastewater. Nanostructured graphene oxide composites, functionalized graphene oxide with nitrogen and hydrogen composite and graphene nanoparticles were suggested as an adsorbents for the removal of the heavy metal ions from aqueous solutions by a batch and continuous adsorption methods.	1

Dr. Németh Zoltán	Application of modified clays in nutrient removal from wastewater	Excess amount of nitrogen and phosphorus entering into the water body can enhance the growth of algae and other water weeds resulting in eutrophication. Traditional BNR (Biological Nutrient Removal) method uses microorganisms for phosphates removal but this method requires highly optimized conditions, alternating aerobic and anaerobic conditions which increased the cost of the treatment process. Proposed study will discover the benefits of pillared clay for phosphorus removal from the wastewater. It could be a potential alternative for the restoration of dying water bodies.	1
Dr. Németh Zoltán	Textile-based wastewater treatment applying enzymes and poultry plumage	Major problems relating to the textile wastewater treatment is effective degradation of colour and removal of heavy free metal or metallic compounds. Decolourization of waste water using biological method is one of the most effective techniques. Although enzymatic treatment is found very effective in decolorizing the textile effluent but still have very serious issues that restricted its commercial utilization. The overall research aim is to investigate cost effective approaches to treat textile wastewater using enzymes in combination with poultry plumage.	1
Dr. Szőri Milán	Theoretical investigation of reaction mechanisms relevant to biology and industrial applications	In chemical industrial processes, characterization of kinetically relevant reaction channels can be the first step to avoid the formation of the unwanted intermediates and side products. Detection of these species is a challenge even for advanced experimental techniques, while such information can be obtained from accurate *ab initio* calculations of the reactive potential energy surface. Aim of this project is to calculate reactive potential energy surface relevant to chemical industry	1
Prof. Dr. Török Tamás	Plasma surface engineering studies of metals coatings	Corrosion protection of Mg and Al alloys has been a great challenge for surface engineers, therefore, the electrolytic anodic and plasma oxidation techniques, environmental friendly conversion layers, electroless and other new coating systems will be studied concurrently with further development of a special in depth surface analytical method (GD OES) working with plasma ablation. In addition, the research project is also aiming at developing at least one novel solution in the field of light metals surface treatments based on better exploitation of the GD OES technique.	1
Dr. Veres Zsolt	Effect of melt flow on solidified microstructure of Al-Si Eutectic	Under earth conditions melts are flowing. The rate of melt flow can be increased by rotating or travelling magnetic field. Microstructure of solidified Al-Si Eutectic, which were formed by induced melt flow, is investigated as a function of rate of melt flow.	1

Dr. Veres Zsolt	Effect of melt flow on solidified microstructure of Al-Al_3Ni Eutectic	Under earth conditions melts are flowing. The rate of melt flow can be increased by rotating or travelling magnetic field. Microstructure of solidified Al-Al3Ni Eutectic, which were formed by induced melt flow, is investigated as a function of rate of melt flow.	1
Dr. Veres Zsolt	Effect of melt flow on columnar-equiaxed transition	The mechanical properties of a workpiece are influenced inter alia by the structure of them. With change of the parameters of solidification, the microstructure of the workpieces is changing. One of the most popular investigated topic is the columnar-equiaxed transition in the microstructure during solidification. The effect of melt flow will be investigated on this phenomenon.	1