

## Kratek opis usposabljanja mladega raziskovalca (*Short description of the Young Researcher's training*)

1. Raziskovalna organizacija (*Research organisation*):

Univerza v Ljubljani  
Naravoslovnotehniška fakulteta

2. Ime, priimek in elektronski naslov mentorja (*Mentor's name, surname and email*):

Aleš Nagode, ales.nagode@omm.ntf.uni-lj.si

3. Šifra in naziv raziskovalnega področja (*Research field*):

2.04 Materiali Materials

4. Kratek opis usposabljanja mladega raziskovalca (*Short description of the Young Researcher's training*):

Navedite tudi morebitne druge zahteve, vezane na usposabljanje mladega raziskovalca (npr. znanje angleškega jezika, izkušnje z laboratorijskim delom, potrebne licence za usposabljanje...).

*V okviru doktorskega usposabljanja bo kandidat spoznal različne metode sinteze in karakterizacije kovinskih materialov. V okviru sinteze kovinskih materialov bo dan poudarek na izdelavi zlitin na osnovi železa z nizkim tališčem brez dodatkov dragih legirnih elementov (npr. Cr, Ni). Nekatere tovrstne zlitine se lahko izdelajo v obliki kovinskih stekel, torej z amorfno strukturo, lahko pa bi se lahko uporabile tudi za dodajni material za spajanje z nižjo porabo energije.*

*Makroskopske lastnosti kovinskih materialov oziroma zlitin, med katerimi so med najpomembnejšimi mehanske lastnosti, so izrazito odvisne od njihove mikrostrukture. Na razvoj mikrostrukture zlitin izrazito vplivajo poleg sestave tudi pogoji ohlajanja pri strjevanju. Pri spajanju materialov igra pomembno vlogo difuzija med dodajnim in osnovnim materialom. Zato bo poudarek na poznavanju in analizi faznih diagramov, reakcijam med različnimi komponentami in njihovi kinetiki, načrtovanju in izdelavi novih materialov ter njihovi uporabnosti v praksi.*

*Poleg sinteze bo pomemben del usposabljanja kandidata tudi karakterizacija mikrostrukture kovinskih materialov z različnimi sodobnimi metodami in orodji kot so svetlobna mikroskopija (SM), vrstična (SEM) in presečna (TEM) elektronska mikroskopija, mikrokemijska analiza (EDS, WDS). Za določevanje kristalne strukture faz v mikrostrukturi bo kandidat uporabljal rentgensko strukturno analizo (XRD) in metodo uklona povratno sipanih elektronov (EBSD).*

*Uporabnost materialov je določena z mehanskimi, fizikalnimi in tehnološkimi lastnosti. Zato bo v okviru usposabljanja kandidat preučil in osvojil načine merjenja različnih mehanskih in fizikalnih lastnosti zlitin, možnosti in načine spajanja materialov ter karakterizacijo kakovosti nastalih spojev.*

*V okviru doktorskega usposabljanja kandidata bomo sodelovali z domačimi in tujimi institucijami znanja in slovenskimi ter tujimi industrijskimi partnerji.*

*Prednost pri izboru imajo kandidati z zaključenim študijem na 2. stopnji Materiali, Metalurgija ali Proizvodne tehnologije.*

*eng:*

*In the frame of doctoral training, the candidate will learn various methods of synthesis and characterization of metallic materials. As part of the synthesis of metal materials, emphasis will be placed on the production of low-melting iron alloys without the addition of expensive alloying elements (eg Cr, Ni). Some of these alloys can be made in the form of metallic glasses, i.e. with an amorphous structure, but they can also be used as filler materials for joining with lower energy consumption.*

*The properties of alloys, among which the most important are mechanical properties, are highly dependent on their microstructure. The development of the microstructure of alloys are dependent on the composition, as well as cooling conditions during solidification. In the case of joining of materials, the diffusion between the filler material and the base material plays an important role. Therefore, the emphasis will be on the knowledge and analysis of phase diagrams, the reactions between the various components and their kinetics, the design and production of new materials, and their applicability in practice.*

*In addition to the synthesis, an important part of the candidate's training will be the characterization of the microstructure of metallic materials with various modern methods and tools such as light microscopy (LM), scanning (SEM) and transition (TEM) electron microscopy, micro-chemical analysis (EDS, WDS). For structural determination of phases in the microstructure the candidate will use x-ray diffraction analysis (XRD) and electron backscatter diffraction (EBSD).*

*The usability of materials is determined by mechanical, physical and technological properties. Therefore, in the frame of the training, the candidate will also examine and use the methods of measuring the various mechanical and physical properties of alloys, the possibilities of joining of materials, and the characterization of the quality of the resulting joints.*

*Within the doctoral training the candidate will work with domestic and foreign research institutions and Slovenian and foreign industrial partners.*

*The candidates for doctoral study should have finished the master degree of Materials, Metallurgy or Production Engineering.*