Report of the supervisor on doctoral thesis of Ing. Veronika Mazánová

Doctoral thesis of Ing. Veronika Mazánová are devoted to the study of the initiation and growth of fatigue cracks in materials for high temperature applications both at ambient and elevated temperatures. The material under study is advanced superaustenitic steel used for the design and production of components for new generation of coal-fired power plants allowing to withstand high temperatures and service loadings.

Ing. Mazánová since the first year of her PhD study was keen to learn number of demanding experimental techniques like preparation of clean surfaces, production of thin foils, observations and documentation in scanning and transmission electron microscopy and production of FIB trenches which were necessary to master in order to be able work successfully on the thesis. She succeeded and was able to start working on the very subject of her thesis but also participate on a number of other projects in the group of low cycle fatigue. This resulted in the number of impacted publications not only in the field of the thesis but on similar subjects namely in fatigue crack initiation in model materials and in fatigue damage studies in multiaxial cycling. She also participated in half-year study stay at Paul Sherrer Institute in Switzeland. This all and the permanent analysis of the scientific literature in the field of materials fatigue allowed to widen her knowledge in the field of material science and work successfully on the theses.

The theses contain number of important contributions to the field of fatigue damage in materials for high temperature applications. The most important are:

(i) Contribution to the mechanisms of fatigue crack initiation at ambient temperature showing the relation of persistent slip markings and dislocation structure of persistent slip bands and also the clarification of the role of persistent slip bands in intergranular cracking.

(ii) Contribution to the mechanism of fatigue crack initiation at elevated temperature showing the role of preferred oxidation of grain boundaries and cracking of the oxide during cyclic loading.

(iii) Contribution to the mechanisms of the early crack growth in low cycle fatigue regime due to linking of surface cracks.

(iv) Contribution to the short crack growth by improving the definition of equivalent crack and establishing the kinetics of short crack growth in dependence on plastic strain amplitude and J-integral.

(v) Contribution to high temperature crack growth by analyzing the role of redistribution of individual elements during grain boundary oxidation and cracking in high temperature cyclic loading.

All these results were achieved due to her steady diligence and high level of scientific competence based on the literature analysis, mastering experimental facilities and distinctive analytical capabilities.

The manuscript of the theses has according to my opinion high scientific level, contains original results and I can recommend it to be accepted as a Ph.D. theses.

Brno, 23th October 2019

Prof. RNDr. Jaroslav Polák, DrSc. dr.h.c.

Ph.D. supervisor