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Subject: *Opponent's Review Report on the Dissertation by Ing. Jan Kaufman*

Supervisor: Doc. Ing. Ladislav Pína, DrSc.

Supervisor specialists: Prof. Seetha Ramaiah Mannava, DrSc.

The purpose of this report is to testify about the contributions that Ing. Jan Kaufman has made as a researcher, during his PhD study and to evaluate his PhD Thesis whether it is suitable for presentation and defense. Let me first emphasize that I am delighted to be chosen as the opponent for the Dissertation by Ing. Jan Kaufman, since the topic is an extension of my own specialization in the field of laser surface treatments, laser-matter interaction, and materials science.

The thesis has approximately 140 pages (without bibliography) and it is well organized, prepared with great care and with very high graphical quality. As far as I can judge, its English is of high level and the work includes an extensive literature survey in order to analyse the current state of the art (SOTA). The background and the method of choice to assumed for the analysis are exhaustively described and motivated and the candidate shows a proper knowledge of the topic.

Dissertation covers the important aspects of laser shock peening (LSP) treatment and its inhibition effect on stress corrosion cracking of Mg-rich, 5xxx Al alloy in different metallurgical state. Even though the abovementioned Al alloys are commonly used in marine applications they remain the subject of numerous studies due to their susceptibility to localised corrosion attack in the form of pitting or even intergranular corrosion (IGC) and intergranular stress corrosion cracking (IGSCC), especially in the sensitized state. Hence, additional surface protection is frequently essential and is usually provided by various types of coatings or in cases in which mechanical and micro-structural enhancements are required, with different surface engineering processing techniques. In this work, advanced, up-to date LSP with and without the coating was applied to sensitized AA5083-H116 alloy samples to reduce the corrosion susceptibility. Using modern equipment for LSP treatment, monitoring of electrochemical corrosion phenomena (cyclic & potentiostatic polarization, EIS), Slow Strain Rate Tests (SSRT), confocal laser

scanning microscopy, X-ray stress analysis, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), X-ray photoelectron spectroscopy (XPS) and corrosion fatigue tests the surface topography, residual stresses, corrosion and corrosion fatigue resistance, IGSCC analyses, dislocation structures, etc. were systematically analysed after application of laser-induced plasma and high-pressure shock waves by LSP.

I can state without any doubt that the goals of the thesis have been achieved and that the scientific value of the PhD thesis results are very high, beyond the current SOTA. This is additionally confirmed by the exceptional contribution of Mr. Jan Kaufman to the Materials Science community. In the peer-reviewed journals the candidate has published eight (8) works and three (3) of them as the first author. All of them are well considered and recognized within the LSP & Materials Science community. In addition, the candidate's scientific paper, entitled "*The effect of laser shock peening with and without protective coating on intergranular corrosion of sensitized AA5083*" has been published in respected journal of Corrosion Science with an impact factor of $IF=7.72$, which confirms his exceptional scientific achievements.

In conclusion, the submitted thesis of Mr. Jan Kaufman is no doubt successful and brings a great deal of important original results which are significant for further progress in LSP technology and applications. The candidate clearly demonstrated his ability of scientific work, and his thesis fulfils the expected requirements. I believe that Mr. Jan Kaufman is an exceptional scientist and engineer, with a very broad background and skillset and significant contributions to the materials science field. That is why it is my pleasure to suggest, after successful defence, awarding him with the PhD. title.

Sincerely yours,
Doc. Ing. Uroš Trdan, DrSc.