

University POLITEHNICA of Bucharest
Faculty of Engineering & Management of Technological Systems

Habilitation Thesis Summary

Industrial Engineering

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The Habilitation Thesis, entitled *Contributions concerning Optical Fibres Reliability*, has been drafted based on the main research results obtained during more than fifteen years of research on the topics of optical fibres characterisation, aging mechanisms and lifetime evolution.

The PhD Thesis, entitled *Researches and contributions on plastic deformation of metal matrix composites*, coordinated by Prof. Gheorghe Zgură, finalised in May 1997, was presented within the Politehnica University of Bucharest and the University Louvain la Neuve, Belgium, too.

The knowledge acquired in the composites study has revealed fruitful for the next professional step : the optical fibres testing, damage mechanisms and their in-service behavior understanding. In parallel, since more than twenty years, a significant work has been dedicated to quality engineering and management, being in charge for different courses as: Quality Assurance, Integrated Management Systems, Consumer Protection a.o. In the framework of this topics, I'm habilitated by the Ministry of Justice for technical expertises, too.

The Habilitation Thesis is structured in three parts. The **part A: Academic, research & scientific results** details the professional activity comprising of teaching, publishing teaching materials and research articles, technical expertise, administrative activity. The four main research topics of the scientific activity, including the publications and the cited references are structured as composite materials, optical fibres, quality engineering and management and finally, educational projects and other collaborations.

Part B: Contributions concerning optical fibres reliability presents in extenso the framework, the experimental procedures for testing optical fibres, including the Weibull treatment, then numerous series of testing in order to explore the silica optical fibres behaviour in different aging conditions as: mechanical damage, mechanical stretching, combined aging (such as overlapped microwave energy), chemical exposure to humidity for short, respectively long durations, with overlapped mechanical stress, and finally chemical exposure to different harsh reagents (fluorinated environment, DMSO, acetylene, ammonia a.o.). Mechanical testing – static and dynamic fatigue testing, tensile testing - followed by SEM investigations in order to validate damage mechanisms have been extensively explored. The structural relaxation phenomenon in the presence of water, responsible for improved lifetime in-service, has been noticed and explained. The different behaviour of the silica optical fibres subjected to harsh environments has been detailed. Based on this topics, three research agreements have been implemented.

Part C: Perspectives for carrier evolution and research development presents research challenges and trends that are intended to be investigated as PhD coordinator of the Politehnica University doctoral school, the branch Industrial Engineering. A preliminary investigation on optical fibres embedded systems (smart composites) has revealed encouraging results already reported in open access journal Materials (IF2.654_2016). Two main topics are proposed on the research agenda: advanced materials characterisation and their associated technologies and processes, management systems and industrial excellence.