

Hodnocení disertační práce

Téma: Geopolymerní kompozitní systémy na bázi termální siliky: studie postupu přípravy a mechanických vlastností

Student/autor : Tran Doan Hung

Disertační práce se zabývá vypracováním rešerše metodiky pro přípravu vzorků a jejich základní hodnocení.

Samotná práce je milým překvapením a měla by být motivací pro určité typy českých studentů, zejména úrovní vyjadřování se k technickému problému v cizím jazyce.

Dílo je přehledně zpracováno a vypovídá o osobním zaujetí pro dané téma samotného studenta.

Co je možné vytknout obecně, snad samotnou obsáhlou celou práci a srovnání s konkrétními materiály, které by mohli být přímymi konkurenty (např. Macor, Vitronit) na trhu, pro dané aplikace, eventuálně hrubě cenově odhadly finálního produktu-polotovaru.

Pro úplnost jsou níže uvedeny drobné nesrovnalosti a některé otázky, které by během obhajoby dotvořili celkově příznivý pohled na práci.

1. V anotaci (str.ii) jsou uvedeny hodnoty jako např. mez ohybu bez určení metody měření, toto může být zavádějící pro hrubé srovnávání s jinými materiály.

2. Kapitola 3.2.1 bylo řešeno i možnost nehomogenního stavu (sedimentace, odměšování,..) geopolymerní pryskyřice v nádobce během nanášení na vláknina, a vliv na finální vlastnosti (trhliny, porézita,..)?

3. Kapitola 3.3.1 byla záměrně zvolen 3bodový ohyb a proč? Struktura a povrch dle SEM vykazuje poměrně rozsáhlou síť propojených povrchových markotrhlin (viz obr.4.2.) proč nebyl zvolen ohyb 4 bodový nebo eventuálně biaxiální, který lépe charakterizuje takto narušené povrchy a zodpovědně odhalí slabiny materiálu ve větší části objemu vzorku?

Práci doporučuji k obhajobě

Recenzent

Ing. Vladimír Šída, CSc.



- popisky os u grafu
9. Drobné písemné chyby, str.65 hustota Mg.m^{-3} místo kg.m^{-3} a str. 66 české teplotě 75°C ?
 8. Obr.5.1 je možné lépe vysvětlit skokové zlepšení vlastnosti (až o cca 25%) při smrštění je již stále na čase neměnné?
 7. Smrštění 15,5-18,5% je v souladu s množstvím aditiv?, toto poměrně velké zkoušky pod vakuem, či jiné metody.
 6. K popisu měření hustoty, by bylo dobře osvětlit , zda bylo použito normované změně mechanických vlastností, při běžné pokojové teplotě?
 5. Během přípravy vzorků, bylo skutečně vyčerpáno veškeré úsilí na zvýšení zásadní vliv na finální číselné hodnoty.
geometrie a odchylky, více viz norma ASTM C 1341. tyto parametry mají technologie obrábění a povrchové drsnosti vzorků, jakožto naměřené hodnoty dodržena technologie dle příslušné normy, přípravy vzorků včetně abrasiv či hustoty jednotlivých vzorků a odchylka od těchto u skutečných vzorků?
 4. U přípravy vzorků pro zkoušku ohybem, chybí popis zda skutečně byla

V shrnutí na str.94 není jednoznačně popsáno doporučení na limitní množství pórů(eventuelně limitní hustotu finálního materiálu) kde dochází ke zlomové

Koszalin, 24 December 2010

Review of PhD thesis

Ing. Tran Doan Hung:

“Thermal silica-based geopolymer composite system: study of processing and mechanical properties”

Supervisor: Prof. Ing. Petr Louda, CSc

1. Evaluation of originality of the problems and correctness of research propositions of the work

PhD thesis Tran Doan Hung: *“Thermal silica-based geopolymer composite system: study of processing and mechanical properties”* concerns the problems connected with the very modern engineering field. From one side composite materials had been known in various forms about 3000 years. The history of modern composites probably began in 30 decade of the twentieth century. In 1978, Joseph Davidovits proposed that binders could be produced by a polymeric reaction of alkaline liquids with the silicon and the aluminum in source materials of geological origin. Precisely, these binders have been coined as term geopolymers since 1979. In spite of many reports both in fields of fundamental and application researches it is hard to state that all the problems are solved in this area. At the same time appears a demand for the layer material which inhibits a corrosion processes development, which is the main subject of reviewed dissertation. Still we can find a new application areas, sometimes very sophisticated. It proves the topicality of presented dissertation.

The thesis is the creative continuation of the works of Doc Dora Kroisova, from the same, full of inspirations and brain storms Laboratory, headed by Professor Petr Louda. It is worth to notice that as all researches supervised by Professor Louda also these present high quality and solidity.

2. Evaluation of content-related of the work.

The work contains 160 pages of typescript, 79 figures and 35 tables, includes a literature review (37 pages, 16 figures) and individual researches. In the literature review candidate for a doctor's degree introduced the notions applied in the field of polymers, geopolymers and discussed kinds and manufacturing techniques of these materials. The literature review was worked out on the basis of 126 references. Interdisciplinary considerations in the material science field are conducted with high dose of cognition and criticism which proves the ability to knowledge synthesis and scientific maturity of the candidate for a doctor's degree.

In reviewers opinion the most important parts of the dissertation are as follows:

- Based on mechanical properties, microstructures and total porosities, the optimal curing conditions are determined.
- It should be also underlined the utilitarian aspect of realized work. There is a possibility of utilization of obtained research results in practice, though it wasn't specially emphasized by the candidate for a doctor's degree.

The scientific level of the elaboration is high, although the candidate for a doctor's degree made few mistakes. I will quote some of them in presented review.

- The chemical mechanism of the procedures is not explained.
- The mechanical properties just defined under static load. In real applications, the load could be impact or repetitive or both. So, the impact test and fatigue properties should be taken into account.
- In order to widen the potential applications of geocomposites, their properties must be determined at minus temperature.
- In my opinion it is inadmissible to skip coauthors names of the works (et al.).
- The dissertation contains small editor's faults.

Despite of this and other mistakes and misinterprets in my opinion the dissertation presents adequate level and deserves for positive opinion.

2. Final evaluation of the dissertation

The candidate for a doctor's degree demonstrated good knowledge of the subject and proper formulation of the scientific thesis.

The theoretical and experimental researches realized by him doesn't arouse any doubts and content-related stipulates. Its interpretation proves the scientific maturity of the candidate for a doctor's degree.

The dissertation is written in comprehensible way, it possess the attributes of originality and brings in the new cognitive values with comparison to the past state of the art in materials science field.

Taking into consideration remarks mentioned above I voice an opinion that the dissertation of Tran Doan Hung: "*Thermal silica-based geopolymer composite system: study of processing and mechanical properties*" corresponds with the terms established in the titles and degrees law.

On this ground I move to Mechanical Faculty Scientific Council of the Technical University of Liberec to allow the Tran Doan Hung PhD thesis to its public defense.



Technical University of Lodz
Institute of Materials Science and Engineering

Dr hab.inż. Piotr Niedzielski, prof. PŁ
Lodz, 23.12.2010 r

Review of PhD thesis

Ing. TRAN DOAN HUNG

Topic: „THERMAL SILICA BASED GEOPOLYMER COMPOSITE
SYSTEM: STUDY OF PROCESSING AND MECHANICAL
PROPERTIES”

Supervisor: Prof. Ing. Petr Louda, CSc,

Review written on the basis of the letter of the Dean of the Mechanical
Faculty of the Technical University of Liberec Doc. Ing. Miroslav Malý,
CSc. from December 7th 2010r.



Institute of Materials Science and Engineering
90-924 Łódź, ul. Stefanowskiego 1/15 budynek A18
tel. 042 631 22 79 fax 042 631 22 77, e-mail: piotr.niedzielski@p.lodz.pl

General evaluation:

PhD thesis Tran Doan Hung: "*Thermal silica-based geopolymer composite system: study of processing and mechanical properties*" is composed of 9 chapters, references list and 5 appendices. Totally dissertation contains 175 pages of type script, 35 tables and 79 figures. Candidate for a doctor's degree quotes also 126 properly selected references presenting the international range.

Candidate for a doctor's degree is a coauthor of 6 publications and 20 presentations presented on national and international conferences and seminars..

In reviewers opinion the main advantages of the work are as follows:

- Fabrication of geopolymer composites
- Structural analysis of geopolymer composites
- Examination of the mechanical properties in details
- Analysis the influence of curing temperature onto mechanical properties

Dissertation is very interesting. Title of this discourse is: "*Thermal silica-based geopolymer composite system: study of processing and mechanical properties*". The mechanical properties examination results of investigated samples are presented correctly. However there is a lack of research process Therefore, the title of the work is too extensive. Also concepts geocomposite and geopolymers and are not clearly explained.

Other comments

- in english polycondensation is called **step-growth polymerization** page 12
- Reaction 2-2, 2-3 are not stoichiometric page 32
- What is this: specific extinction area (SEA) ? page 36
- Usually sawdust is from the wood. In this case geocomposite is **organic** rather than inorganic? page 36
- What is the meaning of OSU? page 36

- Table 3.2; density is in g/m^2 should be g/m^3 ?
page 48
- Table 4.1; similar problem with density, what does it mean Mg (magnesium, megagrams?)
page 65
- Fig 4.4 description of the graph is in Czech language
page 67
- Fig 6.9 description of the graph is in Czech language
page 111

Final evaluation

All comments mentioned above have the discussion character and don't diminish the positive opinion of the reviewer about the scientific level of the dissertation.

Summarizing, it should be claimed that the dissertation from the materials science field of Mr. Tran Doan Hung: „*Thermal silica-based geopolymer composite system: study of processing and mechanical properties*” corresponds with the terms established in the titles and degrees law.

On this ground I move to Mechanical Faculty Scientific Council of the Technical University of Liberec to allow the Tran Doan Hung PhD thesis to its public defense.

Dr hab. inż. Piotr Niedzielski, prof.PE