ZAŁĄCZNIK 2B

ENCLOSURE NO. 2B

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SUMMARY OF PROFESSIONAL ACCOMPLISHMENTS

Description of scientific achievements and accomplishments

1. General information

I am a graduate from Poznan University of Technology, Faculty of Chemistry. I graduated in 1977 as an MSc. Eng. of chemistry, major: non-organic chemistry and technology. I received my PhD in civil engineering at the Faculty of Civil Engineering, Warsaw University of Technology, in 1985, following submittal of the PhD dissertation: "*Influence of Plasticising Additives onto Selected Properties of Fine-grained Concrete*". The supervisor was Róża Krzywobłocka-Laurów, PhD., assistant professor, and the reviewers: Prof. Edward Szymański, PhD. Eng. and Prof. Jerzy Piasta, PhD. Eng. (at that time Hab. PhD. Eng., assistant professor).
Since 1978, I have been working at the Agricultural University (since 2008 Poznan University of Life Sciences) in Poznan. Firstly, as an assistant-trainee (1978-1979), then assistant and senior assistant (1979-1986), assistant professor (1986-2006), and senior lecturer (since 2006) at the Research Unit of Department of Theory of Structures and Agricultural Building Engineering of the Faculty of Land Reclamation and Environmental Engineering (Faculty of Land Reclamation until 1990).

2. Research activity

My chemistry studies and work in a construction-related unit inspired me to focus on construction chemicals, mainly for the purpose of concrete technology. I became particularly interested in chemical admixtures for concrete, especially plasticisers and the possibilities of modifying concrete properties using such admixtures. At the beginning of my research activity this was a relatively new idea, especially in the domestic research approach. At that time in Poland there was no unambiguous distinguishing between admixture and additive in terms of nomenclature. The research I carried out for my doctoral dissertation concerned

defining of the influence of plasticising admixtures on selected properties of fine-grained concrete. This type of concrete was perceived at that time as material that enabled management of growing resources of fine aggregate with the shrinking pool of natural gravel aggregate. However, because of its less favourable parameters comparing to standard concrete properties, it was justified to modify it. I used domestic admixtures of the plasticising group (NB-2 and SK-1 fluidifiers) to determine how the properties of concrete mixes and hardened fine-grained concrete are modified under their influence (among others: water absorption, frost resistance, shrinkage, compressive strength, modulus of elasticity). In the research, I used the Box composite two factor design. I also analysed the influence of admixtures on the structure and phase composition of fine-grained concrete, using then the state-of-the-art research methods, such as microscopic analysis in reflected light and thermal analysis. The skills gained in 1979 during a three-month scientific placement at the Building Structures Department, Building Research Institute, Warsaw (Enclosure No. 4A do the Application), under the supervision of Róża Krzywobłocka-Laurów, PhD., assistant professor, proved to be extremely helpful in this regard. During the placement, I became familiar with structural testing methods, classical and electron microscopy, X-ray analysis and differential thermal analysis (DTG, DTA and TG) with reference to cement pastes, mortars, and concretes, when studying the subject of: *"Influence of Water-Cement Ratio on Microstructure of Hardened Cement Paste"*. The knowledge obtained during the placement, i.e. at the beginning of my research life, brought my attention to the importance of relations-between the microstructure and phase composition of cement materials and their physical-mechanical properties. The meaning of these relations was at the focus of my research internships in 1987 at *Centro Tecnico de la Construccion y Los Materiales*, Havana, and *Wysoke Uceni Technicke-Fakulta Stavebni*, Brno (Enclosure 4A to the Application). Therefore, naturally I became interested in cement chemistry, focusing on hydration processes. I decided to use the skills acquired in the area of instrumental methods to test cement composites as well as planned experiment consulted with the researchers of the Faculty of Civil Engineering and Architecture and Division of Applied Mathematics, Kielce University of Technology, whenever possible, in my future research activities. The results of research carried out for my doctoral dissertation were published after its defence in *Cement Wapno Gips* [1.3.B.1.1, 2.3.B.1.1, 4.3.B.1.1] and *Inżynieria i Budownictwo* [3.3.B.1.1] periodicals. Following the doctoral defence, my interest in plasticising admixtures deepened. The analysis of literature, in particular English, made it possible to become familiar with the state-of-the art world trends in plasticising admixtures development, evolving towards superplasticisers. The research ideas concerning superplasticisers were clearly emphasised at international conferences, directly focused on admixtures (the first was held in 1978, the following are organised regularly) but also at cement chemistry congresses and concrete technology conferences as well as in prestigious thematic periodicals of global coverage. At that time, national research in superplasticisers had not been that broad. I started the research by carrying out experiments with the first Polish superplasticiser admitted for use in civil engineering, Betoplast 1, and defining its impact on standard, Portland cement concrete, where a part of it was replaced with fly ash [5.3.B.1.1, 6.3.B.1.1], determining the values of water-binder ratio, w/b and fly ash content level to offer the highest efficiency of the admixture's performance. A useful tool to evaluate this effectiveness was the method of multicriteria statistical optimisation [7.3.B.1.1].

Furthermore, I carried out studies of the cement pastes' resistance to sulphates, simultaneously defining the phase composition of these pastes, stating improvement of resistance when the aforesaid admixture was applied, which depended on different phase composition of pastes [3.3.B.2]. The Betoplast 1 research was a part of the project carried out at the Department within the Central Research and Development Programme - CBPR 6.4 (Enclosure No. 4B to the Application), focused mainly on the evaluation of the superplasticiser's performance but also on the use of fly ashes for construction needs.

The growing interest in the application of mineral additives, including silica fume, for concrete technology, encouraged me to test its influence on concrete properties for the purpose water sewage treatment plant structures, becoming part of the Department's research trend. Inspired by current trends in research and construction applications in Austria and Switzerland, I had the occasion to learn during my 1993 placement at *Sika Chemie Bludenz Bings* (Enclosure No. 4A to the Application), I used a polymer-modified type silica fume for Portland fly ash cement concrete. The results of my own research concerning water absorption and compressive strength of concrete after initial and late periods of hardening [9.3.B.1.1] and literature data convinced me to assume the hypothesis that different impacts of the mentioned above material could depend on the type of cement. I conducted research on cooperation of the modified silica fume and melamine superplasticisers in concrete made of 'pure' clinker Portland cement. Simultaneous application of both materials turned out to be justified, proving, among others, less air content in concrete mix, lower water absorption and improved compressive strength of concrete both after initial and late periods of hardening [10.3.B.1.1]. Diverse results of the aforementioned tests, depending on the type of cement, world literature approaches, placing application of superplasticisers among the top issues of modern concrete technology, emphasising the idea of adequate selection of cement-superplasticiser, and the aforesaid placement at *Sika Chemie*, including a visit of the *Research and Development*, Zurich (Enclosure No. 4A to the Application), inspired me further to take up research into the relation of Portland cements with varied mineral composition and fluidifying admixtures on different chemical base. I was involved with these problems between the years 1993-1995 as part of the State Committee for Scientific Research project No. 7S103 02804 called "*The Mechanism of Superplasticizers' Impact on Cement Paste in Concrete*", of which I was the supervisor and one of two contractors, followed by my author research (Enclosure No. 4B to the Application). Three different Portland cements were used for the research, with special attention paid to their different content of tricalcium aluminate C_3A, which is principally important concerning the impact on efficiency of superplasticisers, in particular of the first generation; melamine and naphthalene admixtures were used. Broad testing of the phase composition of cements, aggregates, cement pastes, and concretes was carried out with consequent implementation of the planned experiment and a variety of instrumental testing methods (X-ray, thermal analysis and scanning electron microscopy technique for observation of microstructure of cement matrix composites). Statistical multicriteria optimisation was used to work on the results, which allowed to obtain response surfaces for the tested cement material properties. An attempt was made to explain how the cooperation of different cements and plasticising admixtures with different chemical base influences the selected properties of cement pastes and concretes, and the composition of their hydration products. It was demonstrated which type of cement, considering its C_3A content,

and which superplasticiser (with quality and quantity variations) combined prove the most favourable properties of cement pastes selected for testing. This, of course, concerned the assumed research area. The experiment was continued as part of my own research (Enclosure No. 4B to the Application), focused on modification of fresh and hardened ordinary concrete properties using superplasticisers. I presented the results of experiments conducted under the research project and on my own that proved usefulness of melamine superplasticiser application in cements with lower content of tricalcium aluminate as well as conformed the relation of hardened concrete properties with the phase composition and microstructure during national [4.3.B.4, 8.3.B.4, 9.3.B.4, 13.3.B.4] and highly recognised international conferences, such as: *10th Congress on the Chemistry of Cement*, Sweden (Goteborg) [6.3.B.4], *International Conference on Advances in Materials and Processing Technologies AMPT*, Ireland (Dublin) [14.3.B.4, 15.3.B.4], *6th International Conference on Superplasticizers in Concrete*, France (Nice) [17.3.B.4]. I also published them individually or as a co-author in PUT's *Zeszyty Naukowe* [13.3.B.1.1], Poznan Agricultural University *Roczniki* [15.3.B.1.1], *Archives of Civil Engineering* [11.3.B.1.1] and Thomson Reuters journals: *Cement and Concrete Research* [17.3.B.1.1], *Journal of Materials Processing Technology* [20.3.B.1.1, 22.3.B.1.1]. I stated lower absorbability and improved compressive strength of concrete following the application of superplasticiser in standard maturing conditions, effects of maturing conditions on concrete compressive strength with and without superplasticiser addition with lowered quantity of water bound in hydration and hydrolysis products, and content of calcium hydroxide as well as more compacted structure and stronger aggregate – cement paste interfacial transition zone in concrete modified with superplasticiser.

In 1997 I started scientific cooperation with Prof. Narcyz Piślewski, PhD. of the Institute of Molecular Physics, Polish Academy of Sciences, Poznan. The paper on using the method of nuclear magnetic resonance, NMR, to test the level of water binding with Portland cements with mineral additives, presented by Professor Piślewski at the then Faculty of Civil Engineering, Architecture, and Environmental Engineering, PUT, and the discussion that followed, was my inspiration to take up joint research focused on the hydration processes of cement pastes with melamine and naphthalene superplasticisers using NMR method (measurement of water protons' relaxation time T_1 changes in hydration time function). Research covered Portland cement CEM I, white cement, and cements with varied C_3A content. The cooperation that dated back to 2002 resulted in national and international conference presentations: posters [10.3.B.4, 11.3.B.4, 12.3.B.4], extended abstracts [10.3.B.2, 11.3.B.2], paper presentations [9.3.B.4], and finally, following a conference discussion, in joint publications in *Cement Wapno Beton* [18.3.B.1.1, 5.3.B.1.2]. The results of research conducted in the years 1997-1999, using NMR, concerning cement pastes with melamine superplasticisers, made of cements with different tricalcium aluminate content, which continued my research on effects of fluidifying admixtures depending on C_3A content, were presented in chapters 4.4 and 5.2 of the monograph *"Efficiency of Superplasticisers at Various Cement Types"* [27.3.B.1.1]. They proved usefulness of the NMR method in evaluation of the hydration processes at the stage of setting in cement pastes with superplasticisers.

The beginning of the 1990s of the 20th c. brought a completely new group of cement composites, i.e. Self-Compacting/Self-Consolidating Concretes (SCC). Their occurrence is

partly connected with a new generation of superplasticisers with, among others, polycarboxylate (PC) base and the required use of microfillers for their production and, in some cases, the use of admixtures that improve viscosity. I turned to the research area (as part of my own research and the statutory research – Enclosure No. 4B to the Application) of these concretes, still in the context of cement-superplasticiser compatibility, finding different scientific opinions on the compatibility. The research concerned self-compacting fresh concrete (rheological properties, air content, resistance to segregation) and hardened concrete (compressive strength, water absorption, watertightness) made of different cements (among others: Portland cement, Portland fly ash, and Portland blast-furnace cement). I also examined the efficiency of polycarboxylate superplasticiser's performance in self-compacting concretes made of Portland cement CEM I with two types of microfillers, fly ash and fly ash together with microsilica. The results of the work were published in *Acta Scientiarum Polonorum* [26.3.B.1.1, 24.3.B.1.1]. The relation of performance of the PC plasticising admixture and the type of cement in self-compacting concretes proved to be less apparent than in the case of SMF and SNF superplasticisers in ordinary concretes. More favourable cooperation of superplasticiser in self-compacting concretes was observed when fly ash was used as microfiller together with silica fume.

The long-standing research concerning the cement-superplasticizser compatibility was developed in the monograph: "*Efficiency of Superplasticisers at Various Cement Types* [27.3.B.1.1]. In the work, I used the previously published results of my own research in a discussion based on the literature regarding the state of water in cement paste, the nature of superplasticisers, and cement-superplasticizer cooperation, as well as the research on superplasticizers performance, by 'writing them down' in the chapter contents and synthesising. Some of the research main topics presented in the aforesaid publication were presented for the first time (among others the one concerning performance of polycarboxylate superplasticisers in ordinary concretes made of Portland and slag cements; also the NMR method use in testing cement pastes modified with superplasticiser and made of cements with varied content of C_3A).

The natural consequence of the progress of self-compacting concrete technology was my interest in *Viscosity Modifying Agents (VMAs)/Viscosity Enhancing Agents (VEAs)* for self-compacting concrete mixes. I studied the effect of VMA on selected rheological properties, resistance to segregation and compressive strength of self-compacting concrete. The main subject of research was performance of the viscosity modifying agent. However, given the obvious presence of a new generation superplasticiser in self-compacting concrete, the research constitutes continuation of the works on the superplasticisers' performance. They proved usefulness of the viscosity modifying agent (due to the properties of the concrete mix and the resulting improved homogenity of hardened concrete) on the condition of using it in optimum quantity. The relevant results and analysis thereof were presented in the paper included the highly recognised periodical *Journal of Civil Engineering and Management* [29.3.B.1.1]. In appreciation of my experience and research results, the editors of *JCEM* entrusted me with the review of the manuscript of a paper on self-compacting concrete and a paper on injections modified with chemical admixtures and additives (3.B.5.1 in Enclosure No. 3A to the Application).

Most of my research activity refers to efficiency of superplasticisers in cement matrix composites in different conditions, depending on the type of cement (with particular attention focused on the content of tricalcium aluminate), type of microfiller, and the presence of viscosity modifying agent in self-compacting concretes. In some cases I combined it with the research subjects resulting from the Department profile and 'environmental engineering' as the major of studies offered at the Faculty (live stock buildings, sewage treatment plants, water structures) [9.3.B.1.1, 10.3.B.1.1, 15.3.B.1.1, 16.3.B.1.1]. As regards farm and water constructions, the research I conducted concerned also modifiers other than fluidifying admixtures (bitumen emulsion [1.3.B.4, 2.3.B.2], dampprofing admixture [12.3.B.1.1]).

A parallel research subject resulting from the research and education profile of the Department at which I am employed are the issues of concrete corrosion and durability of concrete and reinforced concrete structures, which was reflected in the papers presented at national conferences: XII i XIII *Konferencji Naukowo- Technicznej „Trwałość budowli i ochrona przed korozją" KONTRA (12th and 13th Research Conference on Durability of Structures and Protection against Corrosion)* held in Zakopane [16.3.B.4, 17.3.B.2] and the following international conferences: *International Conference on New Developments in Building Technology,* Slovakia (Bratislava) [5.3.B.4], *4th International Conference on Concrete and Concrete Structures,* Slovakia (Zilina) [18.3.B.2], *9th and 10th International Conference on Modern Building Materials, Structures and Techniques*, Lithuania (Vilnus) [20.3.B.1.1], also in the papers in *Ochrona przed Korozją* [14.3.B.1.1, 19.3.B.1.1, 21.3.B.1.1]. Different, interesting cases of concrete and reinforced concrete corrosion were presented therein including the analysis of causes and effects of destruction.

Recently, I have been involved in the research area connected with environmental protection. These refer to aggregates and recycled concretes in the aspect of their potential use for sequestration of the atmospheric carbon dioxide. I was one of the principal contractors of the State Committee for Scientific Research grant No. N N305 356638, carried out in the years 2010-2013 called "*Effectiveness of the Use of Hydrophobizing Agents, Atmospheric Carbon Dioxide Absorption and Microbiological Process to Improve Technical Parameters of Aggregates and Recycled Concretes*" (Enclosure No. 4B to the Application). The project was finished on 31 st of March 2013 and final report has been submitted in May 2013. Application for the grant was inspired by the current global trends focused on searching new methods of limiting the anthropopressure caused by the emission of greenhouse gases, which also constitutes a major problem in civil engineering. My work at the university whose activity encompasses natural and technical sciences as well as the research purpose of the grant justified the interdisciplinary approach - the cooperation with a microbiologist, one of the contractors of the research project. The assumed subject matches very well the current trends of combining apparently distant areas, which is confirmed by the fact of publishing, as a co-author, of the initial results of the research concerning the use of calcium carbonate biodeposition method to the surface modification of recycled concrete aggregate, in a prestigious periodical *Construction and Building Materials* [28.3.B.1.1], as well as mentioning of the aforesaid publication in *Advances in Engineering* in 2012, to promote the problem discussed in the paper at the international scientific and application forum.

Moreover, publishing of the said paper resulted in entrusting me with reviews of further manuscripts of papers concerning a similar problem, to *Biochemical Engineering Journal* and

to *Construction and Building Materials,* prestigious periodicals of *Elsevier* publishing house (3.B.5.1 in Enclosure No. 3A to the Application). The research assumed for the grant are continued and summarised and although they refer to a different problem than the one being subject of my research collected in a monothematic series of publications giving grounds for this Application. In this way the research accents from my past reoccur, in a different approach, as the perception of these research issues has considerably evolved. However, both in the past and at present the background of the whole idea was the principle expressed in striving to obtain concretes of the quality as good as possible on the one hand and to re-use waste materials, on the other.

In addition to 12 publications presented as the main monothematic series being the grounds to initiate the postdoctoral title proceedings (Enclosure No. 5 to the Application) I have selected 3 publications (Enclosure No. 7 to the Application), among others the monograph [27.3.B.1.1] and the article published in *Construction and Building Materials* [28.3.B.1.1] to present my scientific achievements wider.

To summarise, the results of my research achievements to date have been presented in 69 works. The total specification of these papers (in breakdown to: original published works, scientific papers, original works published in conference materials and other) is presented in Enclosure No. 3A (in Polish)/Enclosure No. 3B (in English) to the Application.

The total number of works before the PhD was 4, following the PhD - 65, including: 29 original works (including one monograph), 7 scientific papers, 7 other publications, 21 original works published in conference materials (8 national, 13 international), and 1 academic work in national conference materials. The total number of papers presented at conferences, after my PhD defence was 20, of which 8 were presented in the congress language, among others at: 10th *International Congress on the Chemistry of Cement* (Göteborg, 1997), twice at the *16th Annual Conference of the Irish Manufacturing Committee, IMC16* (Dublin, 1999), *6th International Conference on Superplasticizers in Concrete* (Nice, 2000), in the latter case as the only participant from Poland. Three papers (as part of national presentations) were presented at seminars. I participated in several national conferences (among others *„Awarie Budowlane", „Przyrodnicze i techniczne problemy ochrony i kształtowania środowiska rolniczego"* where I presented no paper.

A specification of the number of my postdoctoral research achievements with breakdown to individual groups and indication of publishing place is presented below.

Postdoctoral professional accomplishments in numbers

Type of accomplishment	Number of works
Original published works, name of periodical/publishing house indicated	
a) In foreign periodicals:	
Slovak Journal of Civil Engineering	1
Cement and Concrete Research	1
Journal of Materials Processing Technology	2
Fracture Mechanics and Physics of Construction and Structures	1
Construction and Building Materials	1
Journal of Civil Engineering and Management	1
b) In the English language, Polish periodicals:	
Archives of Civil Engineering	1
Acta Scientiarum Polonorum Architectura	1
c) In Polish periodicals:	
Cement Wapno Gips/Cement Wapno Beton	6
Inżynieria i Budownictwo	2
Materiały Budowlane	1
Ochrona przed Korozją	4
Roczniki Akademii Rolniczej w Poznaniu	3
Zeszyty Naukowe Akademii Rolniczej we Wrocławiu	1
Acta Scientiarum Polonorum Architectura	1
Zeszyty Naukowe Politechniki Poznańskiej	1
d) Monographs	
Wydawnictwo Uniwersytetu Przyrodniczego w Poznaniu	1
Scientific papers, name of periodical indicated	
Inżynieria i Budownictwo	3
Cement Wapno Gips/Cement Wapno Beton	3
Materiały Budowlane	1
Other publications, name of periodical/publishing house indicated	
Chów Bydła	6
Course book of Wydawnictwo Akademii Rolniczej w Poznaniu	1
Original works published in conference materials	
a) foreign	13
b) national	8
Academic works published in national conference materials	1
Conference presentations (presented papers)	
a) foreign	8 (including 3 posters)
b) national	12 (including 3 seminars)

The Hirsch, *h-index* of published works as per the updated (20 May of 2013) *Web of Science* (*WoS*) is 2, citations – 6 (as per with *Scopus* – 15). *Publish or Perish* (*PoP*) in accordance with *Google Scholar* shows 36 citations; *h-index* = 2 as per *PoP*. The total *Impact Factor, IF* according to the year of publishing is 5.465.

3. Grounds to apply for institution of postdoctoral title proceedings

As grounds to initiate the postdoctoral title proceedings, I have assumed the monothematic series of publications under the common title: ***"Performance of Superplasticisers in Cement Cement Matrix Composites"***. The selection contains 12 publications (including one chapter from monograph), 5 individual and 7 co-authored (statements of the co-authors are included in Enclosure No. 6 to the Application), and one chapter in monograph. All items have been specified in chronological order:

1. **GRABIEC A.M., Piasta Z.:** ***Appraisal of effectivness of Betoplast 1.*** Inżynieria i Budownictwo, No. 3/1993, 122-125. (60% own share. Subject formulation, cooperation in research concept preparation, conducting of experiments related to technological part, development of the results, cooperation in the interpretation of the obtained results and working on the paper text).

2. **GRABIEC A.M.:** ***On co-operation of microsilica and superplasticizer in concrete made of Portland cement without mineral additives.*** Roczniki Akademii Rolniczej w Poznaniu, CCLXVIII, Melioracje i Inżynieria Środowiska, 15, part. 2, 1994, 40-46.

3. **GRABIEC A.M., Piasta Z.:** ***Analysis of Superplasticizer Influence on Cement Paste with Multicriteria Statistical Optimization.*** Archives of Civil Engineering/Archiwum Inżynierii Lądowej, vol. 42, 1996, 2, 195-206. (50% own share. Subject formulation. cooperation in research concept preparation, conducting of laboratory tests and preparation thereof for statistical analysis, cooperation in the interpretation of the obtained results, working on the paper text, also in the English version).

4. **GRABIEC A.M., Klodziński I.:** ***On usability of cements with different phase composition for concretes in sewage-treatment plants.*** Roczniki Akademii Rolniczej w Poznaniu, CCXCIV, Melioracje i Inżynieria Środowiska, 9, part. 2, 1997, 149-156. (80% own share. Research concept preparation, cooperation in the experimental part of the work, final development of results, analysis thereof, material and editing preparation of the paper text).

5. **GRABIEC A.M.:** ***Contribution to the knowledge of melamine superplasticizer effect on some characteristics of concrete after long periods of hardening.*** Cement and Concrete Research 29 (1999), 699-704. IF = 0.62(1999)/2.781(2011)/5-year IF

= 3.282// 45 points as per the list of the Ministry o Science and Higher Education of 2012.

6. **GRABIEC A.M., Piślewski N., Grabias T.:** ***Study on hydration of cement pastes modified with superplasticizer with NMR method.*** Cement Wapno Beton No. 1/2000, 17-18. (40% own share. Cooperation in preparation of the research concept and material, development of results, analysis thereof and editing of the paper text).

7. **GRABIEC A.M.:** ***Some characterization techniques for examination of corrosion processes of cement matrix composites.*** Journal of Materials Processing Technology 119 (2001), 283-291. IF = 0.26(2001)/1.783(2011)/5-year IF = 1.881// 30 points as per the list of the Ministry o Science and Higher Education of 2012.

8. **GRABIEC A.M., Piasta Z.:** ***Study on compatibility of cement – superplasticiser assisted by multricriteria statistical optimisation.*** Journal of Materials Processing Technology 152 (2004), 197-203. IF = 0.58(2004)/1.183(2011)/5-year IF = 1.881// 30 points as per the list of the Ministry o Science and Higher Education of 2012. (60% own share. Subject formulation. Cooperation in research concept preparation, conducting of laboratory tests and development of results, cooperation in the interpretation of the obtained results, working on the paper text, also in the English version).

9. **GRABIEC A.M., Kosiński T.:** ***Some characterization techniques for examination of corrosion processes of cement matrix composites.*** Acta Scientiarum Polonorum, Architectura 4(2) 2005, 81-94. (80% own share. Indication of a problem. Research concept and scope preparation, cooperation in the experimental part of the work, final development of results, analysis thereof, material and editing preparation of the paper text).

10. **GRABIEC A.M., Chutek R.:** ***Cement type and properties of self-compacting*** **concrete.** Acta Scientiarum Polonorum, Architectura 7(4) 2008, 3-14. (80% own share. Indication of a problem, research concept and scope preparation, cooperation in the experimental part of the work, final development of results, analysis thereof, material and editing preparation of the paper text, also in the English version).

11. **GRABIEC A.M.: Chapter 4.4.** ***Hydration*** **(47-55)**, in the monograph *Efficiency of superplasticisers at various cement types.* Wydawnictwo Uniwersytetu Przyrodniczego w Poznaniu. Poznań 2011. Publ. sheet. 8.4. (with particular attention paid to unpublished before test results concerning NMR studies on hydration process in cement pastes with superplasticisers) // 25 points as per the list of the Ministry of Science and Higher Education of September 2012.

12. **GRABIEC A.M.:** ***Influence of viscosity modifying agent on some rheological properties, segregation resistance and compressive strength of self-compacting***

concrete. Journal of Civil Engineering and Management 19(1) 2013: 1–8. IF (2011) = 2.171// 50 points as per the list of the Ministry of Science and Higher Education of September 2012.

The offprints/xerocopies of above-mentioned publications are included in Enclosure No. 5 to the Application.

In the enclosed full specification of works (Enclosure No. 3A (in Polish)/3B (in English)) to the Application), the above-mentioned items are in bold; definition of quantity and quality share in a joint publication is given as it is done above). As mention before, some of the works are co-authored. Performance of some of the research, in particular of interdisciplinary nature, which is of crucial importance in science, required broadly understood cooperation with experts on other areas (items: 1, 3, 6, 8 in the aforesaid specification). My final year students were in involved in some of the works [4, 9, 10] conducted within my own research (Enclosure No. 4B to the Application), which enabled familiarising them with the principles of conducting an experiment in accordance with the assumed research hypothesis.

The publications selected for evaluation can be found in different periodicals. It is a selection of papers from different years over which consideration of publication in a given periodical has changed. The prestige of periodicals has also changed. Also the *Impact Factor, IF* evolved, usually growing with time. There were no unambiguous research results evaluation procedures. Some of the research presented in the publications selected for evaluation were previously presented at national and international conferences and then published in conference materials. Discussion that took place during these conferences convinced me about the appropriateness of submittal to periodicals. As regards the monograph (item 11 above, [27.3.B.1.1] in Enclosure No. 3A (in Polish/3B (in English)), previously not published research results are covered by chapters: 4.2, 4.4 and 5.2 and refer to performance of polycarboxylate superplasticiser in standard concretes and the use of NMR method for the analysis of hydration processes in cement pastes modified with melamine superlasticiser, made of cements with varied content of C_3A. As I mentioned under section 2 hereof, the remaining results, previously published, with reference thereto and indication of source were included in the text of work chapters, described in the context of other authors' research and with different opinions in the background. They constitute a specific synthesis of my accomplishments and gave grounds to certain summaries.

4. The keypoint of research and major accomplishments

The keypoint of my research was the evaluation of efficiency of superplasticisers with different chemical base in cement matrix composites made of varied cements.

A significant part of researchers attributes the keypoint of the evaluation of superplasticizers' efficiency to rheological tests of concrete mixes, considering the remaining effects as of secondary importance, and the impact of superplasticisers on the properties of hardened cement composites as indirect. In my opinion, this does not lessen the importance of such research as useful in defining compatibility of the cement-superplasticiser.

The research I conducted concerned to a significant extent the effect of fluidifying admixtures on the properties of hardened cement materials, but also descriptions at the setting stages. It was carried out on cement pastes and concretes (ordinary and self-compacting), in single cases on mortars. Melamine superplasticisers SMF and naphthalene superplasticisers SNF were used as well as of the new generation polycarboxylate group (PC). In the majority of tests CEM I Portland cement was the binder, for some experiments the following were used: Portland slag cement, Portland fly ash cement and blast-furnace cement. Different methods of tests were applied, apart from the standard, also instrumental (among others thermal analysis, scanning electron microscopy, and nuclear magnetic resonance technique). A part of the tests were conducted as planned experiments, using the multicriteria statistical optimisation.

My most important professional accomplishments include:

- proving that the efficiency of superplasticisers depends on the type of cement, in particular the content of tricalcium aluminate C_3A and that the dependence is clearer in the case of fluidifying admixtures of older generation,

- confirming the suitability of instrumental methods (thermal analysis, scanning electron microscopy, and nuclear magnetic resonance) to explain the cooperation of superplasticisers with different types of cement,

- confirming that the microstructure and phase composition of cement matrix composites modified with superplasticisers are very important factors defining their technical parameters,

- proving of the suitability of multicriteria statistical optimisation to anticipation of cement and superplasticiser compatibility in cement pastes, as a 'tool' supporting such compatibility searching in concretes,

- proving of the suitability of testing some cement matrix composites modified with superplasticisers (including microstructure) after longer periods of hardening and in different maturing conditions,

- indication of the advisability of the superplasticisers in self-compacting concretes, based on tests of properties of concrete mixes and hardened concretes in cooperation with different microfillers and viscosity modifying agents.

5. Other than research forms of activity

a. Teaching activity

Following the employment at the University, I started my teaching activity by teaching *building materials* classes at the Faculty of Land Reclamation. After my PhD. and together with the extension of the University's educational offer and evolution of curriculums, the list of classes I teach has grown. Apart from *building materials* (in the academic year 2001/2002 the name was changed to *materials science*) it covered as follows: *hydrotechnical structures* (since 2005/2006 – *hydrotechnical and sewage structures*), *corrosion of concrete, special*

concretes technology, diagnosis, repair and strengthening of hydrotechnical structures, referring to lectures and classes. I have been teaching (with full or sometimes even exceeded workload) on full-time and extramural studies of the '*environmental engineering*' major at the Faculty of Land Reclamation and Environmental Engineering as well as '*landscape architecture*' major at the Faculty of Horticulture and Landscape Architecture, Poznan University of Life Sciences. The results of research were added to the contents of some of the aforesaid classes. After becoming the PhD. Eng., to considerable extent my research area covers also master theses submitted at the MSc. Eng. level of education in the major '*environmental engineering*', Faculty of Land Reclamation and Environmental Engineering, frequently in cooperation with Lafarge Cement and other companies such as: Sika, Schomburg, Chryso, Aarsleff. To date, I have supervised 27 MSc theses.
In 1993, as in the years 1990-2003 I lectured and taught a part of classes in '*livestock buildings*', Faculty of Animal Breeding and Biology, (until 1998 the Animal Husbandry Faculty), Poznan University of Life Sciences, together with Prof. Stanisław Winnicki, PhD. Eng., I wrote an exercise book for that class, which was reissued in 1995 (Enclosure No. 3A (in Polish)/3B (in English) to the Application).
When teaching construction related classes, especially in the initial period of my educational career, I used the knowledge acquired during two vocational placements, I spent in Polish contracting companies (Enclosure No. 4A to the Application).
Detailed information concerning my teaching activity can be found in Enclosure No. 4C to the Application.

b. Training of young employees

The part of my research activity performed within the grant concerning aggregates and recycled concretes, described under section 2 hereof is strictly connected with research supervision of Daniel Zawal, MSc. Eng., employed as an assistant at the Research Unit of Engineering Structures and Farm Construction. Daniel Zawal, MSc. Eng. is a member of the grant team (Enclosure No. 4B to the Application). He is the co-author of the paper published in *Construction and Building Materials* [28.3.B.1.1] and is currently finalising the research conducted since 2009 under my supervision that are to be presented in his doctoral dissertation under the working title: "*Sequestrial Carbonatisation and Biodeposition in Recycled Concretes as Balanced Methods Limiting the Carbon Dioxide Emission and Exploitation of Natural Resources in Construction*". In the experiments, fractional (recycled aggregate was used coming from crushing of original concrete with different values of the w/c ratio of 5 levels and a diversified content of cement. The aggregate first underwent an accelerated carbonatisation in a chamber in which carbon dioxide concentration was continuously monitored and maintained at 7%, for two different levels of relative humidity (two separate experiments, for relative humidity 55% and 80%). Then, concretes were made of the aggregate using CEM I Portland cement 42.5 R, with different w/c ratio values of 2 levels. At the final stage, compressive strength test and endurance test of concretes were carried out. The latter covered: the so-called endurance indexes: sorption, oxygen permeability index, and chloride conductivity test as well as the remaining: absorbability and accelerated carbonatisation (with relative humidity of 55% and carbon dioxide concentration

7%). The control concrete (which properties were described using the same procedure) was made of recycled concrete aggregate protected against carbonatisation. The obtained results show that in the case of recycled concrete aggregate subjected to carbonatisation properties of fresh concrete mix (its stability and air content) and hardened concrete (compressive strength, absorbability and sorption) were improved. Results of tests concerning the effect of surface biomodification of the recycled concrete aggregate, as a result of the interaction of *Sporosarcina pasteurii* strain, were presented in the paper [28.3.B.1.1]. The xerocopy of the issue can be found in Enclosure No. 7 to the Application.

c. Science popularising activity

During my professional career I had the occasion to popularise science in many ways. These covered among others tests concerning concrete technology and evaluation of technical condition of existing structures requiring repairs, including guidelines of procedure, mainly offered as teamwork, on request of design units, companies or institutions. The results were non-published technical documentation, certificates, and expert's opinions specified in Enclosure No. 3A (in Polish)/3B (in English); section 3.A.5.3 and 3.B.5.3)) to the Application.

Furthermore, I have presented papers prepared on request during seminars or training promoting different building chemistry products. The papers were not of commercial nature, as during presentation I was sharing my academic knowledge concerning a given idea and presented results of tests I performed on the specific product. These presentations were addressed to researchers, designers, contractors, and students. One of my recent presentations includes the one offered during the first Night of Science, a science popularising event held annually in Poznan since 2009. Details concerning my science popularising activity can be found in Enclosure No. 4D to the Application.

d. Organisational activity

My organisational activity concerns Poznan University of Life Sciences and covers my work for the benefit of the Faculty (a member of Faculty Commissions, and Organising Committee of the 2nd Scientific Conference held by the Faculty, as a co-organiser responsible for the material content of several scientific seminars in cooperation of the Department with several companies) and the University (as the coordinator of the *Earth Science and Engineering* (*ESE*) module of the educational offer of the Poznan University of Life Sciences for foreign students under the *Socrates-Erasmus* exchange programme; a proactive member of the University team involved in implementation of new forms of teaching quality assessment as part of the *Tempus INQA JEP* 13374 project; as well as in the organisation and by participating on behalf of the Faculty in the Night of Science, mentioned under 5.c. above). Detailed information concerning my organisational activity can be found in Enclosure 4E to the Application.

e. Awards

For my research activity, I was given the University Rector team awards of the 2nd level (in 1997, 1998, 1999, and 2001) as well as individual award of the 2nd level (in 2002).