

5. Pubblicazioni scientifiche

5.1 Pubblicazioni su riviste

5.1.1 Pubblicazioni su riviste internazionali con peer review e IF

1. F. Di Caprio, P. Altimari, F. Pagnanelli (2015) Integrated biomass production and depuration of olive mills wastewater by cultivation of *Scenedesmus* sp. *Algal Research* 9, 306–311
<http://dx.doi.org/10.1016/j.algal.2015.04.007>
2. Granata G., Pagnanelli F., Nishio-Hamane D., Sasaki T. (2015) *Nanoparticles of manganese carbonate by microemulsion mediated route: production and characterization*. *Applied surface science*, 331, 463–471
doi:10.1016/j.apsusc.2015.01.101
3. Pagnanelli F., Schiavi P., Bellagamba M., Moscardini E., Granata G., Toro L. (2015) *Pulsed electrodeposition of cobalt nanoparticles on copper substrate: quantitative assessment of the effects of the operating parameters*, *Electrochimica acta* 155, 228-235.
doi:10.1016/j.electacta.2014.12.112
4. Cibati A., Pagnanelli F. Toro L. (2014) *Metal recovery from end of life hydrotreating catalysts by selective precipitation: lab tests and preliminary process analysis* (*Environmental Progress*)
doi: 10.1002/ep.12053
5. Granata G., Pagnanelli F., Moscardini E., Havlik T., Toro L. (2014) *Recycling of photovoltaic panels by physical operations*. *Solar Energy Materials & Solar Cells* 123, 239-248.
doi: 10.1016/j.solmat.2014.01.012
6. Di Caprio F., Altimari P., Uccelletti D., Pagnanelli F. (2014) *Mechanistic modeling of copper and proton interactions with wild type and engineered *Saccharomyces cerevisiae* biomasses* *Chemical Engineering Journal* 244(15) 561-568.
DOI:10.1016/j.cej.2014.01.098
7. Pagnanelli F., Cruz Viggì C., Beolchini F., Grieco L., Vegliò F. and Toro L. (2014) *Bioactive and passive mechanisms of pollutant removal in bioreduction processes in fixed bed columns: numerical simulations* *Environmental progress and sustainable energy* 33 (1), 70-80.
DOI: 10.1002/ep.11753
8. Pagnanelli F., Altimari P., Trabucco F., Toro L. (2014) *Mixotrophic growth of *Chlorella vulgaris* and *Nannochloropsis oculata*: influence of glucose and nitrate concentration*, *J. Chem. Technol. Biotechnol.* 89(5), 652–661,
DOI: 10.1002/jctb.4179
9. Pagnanelli F., Moscardini E., Granata G., Cerbelli S., Agosta L., Fieramosca A., Toro L. (2014) *Acid reducing leaching of cathode powders from spent lithium ion batteries: glucose oxidative pathways and particle area evolution* *Journal of Industrial and Engineering Chemistry* 20(5), 3201–3207
<http://dx.doi.org/10.1016/j.jiec.2013.11.066>
10. Beolchini F, Rocchetti L, Altimari P, De Michelis I, Toro L, Pagnanelli F, Moscardini E, Kopacek B, Ferrari B, Innocenzi V, Vegliò F (2013) *Urban mining: a successful experience of the EU-FP7 HydroWEEE project* *Environmental engineering and management journal* 12(11):69-72

11. Pagnanelli F., Granata G., Moscardini E., Toro L. (2013) *Synthesis of MnCO₃ nanoparticles by microemulsions: quantitative evaluation of the effect of operating conditions on particle size distribution* Journal of nanoparticle research, 15: 1887-1898
doi 10.1007/s11051-013-1887-8
12. Pagnanelli F., Jbari N., Trabucco F., Martínez M.A., Sánchez S., Toro L. (2013) *Biosorption-mediated reduction of Cr(VI) using heterotrophically-grown Chlorella vulgaris: active sites and ionic strength effect*, Chemical Engineering Journal 231 , 94-102
<http://dx.doi.org/10.1016/j.cej.2013.07.013>
13. Cibati A., Cheng K.Y., Morris C., Ginige M.P., Sahinkaya E., Pagnanelli F., Kaksonen A.H. (2013) *Selective precipitation of metals from synthetic spent refinery catalyst leach liquor with biogenic H₂S produced in a lactate-fed anaerobic baffled reactor* Hydrometallurgy 139, 154-161
<http://dx.doi.org/10.1016/j.hydromet.2013.01.022>
14. Granata G., Pagnanelli F., Moscardini E., Takacova Z., Havlik T., and Toro L. (2012) *Simultaneous recycling of nickel metal hydride, lithium ion and primary lithium batteries: accomplishment of european guidelines by optimizing mechanical pretreatment and solvent extraction operations* J. Pow. Sources 212, 205-211
doi:10.1016/j.jpowsour.2012.04.016
15. Granata G., Moscardini E., Pagnanelli F., Trabucco F., Toro L. (2012) *Product recovery from lithium ion battery wastes coming from an industrial pre-treatment plant: lab scale tests and process simulations* J. Pow. Sources 206, 393-401.
doi:10.1016/j.jpowsour.2012.01.115
16. Pagnanelli F., Cruz Vigi C., Toro L. (2012) *Acid mine drainage attenuation by inhibition of pyrite bioleaching using limestone and olive pomace* Chemistry and Ecology 28(3), 293-303
doi:dx.doi.org/10.1080/02757540.2011.651128
17. Pagnanelli F., Cruz Vigi C., Cibati A., Uccelletti D., Palleschi C., Toro L. (2012) *Biotreatment of Cr(VI) contaminated waters by sulphate reducing bacteria fed with ethanol* Journal of Hazardous materials 199-200, 186-192.
doi:10.1016/j.jhazmat.2011.10.082
18. Pagnanelli F., Ferella F., De Michelis I., Vegliò F. (2011) *Adsorption onto activated carbon for molybdenum recovery from leach liquors of exhausted hydrotreating catalysts* Hydrometallurgy 110 (1-4), 67-72.
doi: 10.1016/j.hydromet.2011.08.008
19. Granata G., Moscardini E., Furlani G., Pagnanelli F., Toro L. (2011) *Automobile shredded residue valorisation by hydrometallurgical metal recovery* J. Haz. Mater. 185, 44–48
doi: 10.1016/j.jhazmat.2010.08.107
20. Cruz Vigi C., Pagnanelli F., Cibati A., Uccelletti D., Palleschi C., Toro L. (2010) *Biotreatment and bioassessment of heavy metal removal by sulphate reducing bacteria in fixed bed reactors* Wat. Res. 44, 151-158
doi:10.1016/j.watres.2009.09.013
21. Pagnanelli F., Cruz Vigi C. and Toro L. (2010) *Isolation and quantification of cadmium removal mechanisms in batch reactors inoculated by sulphate reducing bacteria: biosorption versus bioprecipitation* Biores. Technol. 101, 2981-2987
doi: 10.1016/j.biortech.2009.12.009
22. Pagnanelli F., Cruz Vigi C. and Toro L. (2010) *Development of new composite biosorbents from olive pomace wastes* Appl. Surf. Sci. 256, 5492-5497
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23. Cruz Viggi C., Pagnanelli F., Toro L. (2009) *Sulphate bioreduction for the treatment of polluted waters: solid versus liquid organic substrates* J. Chemical Technology Biotechnology, 84, 859-863 doi: 10.1002/jctb.2168
24. Pagnanelli F., Mainelli S., Bornoroni L., Dionisi D., Toro L. (2009) *Mechanisms of heavy metal removal by activated sludge* Chemosphere, 75, 1028-1034 doi: 10.1016/j.chemosphere.2009.01.043
25. Pagnanelli F., Cruz Viggi C., Mainelli S., Toro L. (2009) *Assessment of solid reactive mixtures for the development of biological permeable reactive barriers in the treatment of heavy metal's contaminated wastewaters* J. Haz. Mater. 170, 998-1005 doi: 10.1016/j.jhazmat.2009.05.081
26. Furlani G., Moscardini E., Pagnanelli F., Ferella F., Vegliò F., Toro L. (2009) *Recovery of manganese from zinc alkaline batteries by reductive acid leaching using carbohydrates as reductant* Hydrometallurgy 99, 115–118 doi: 10.1016/j.hydromet.2009.07.005
27. Pagnanelli F., Mainelli S., Toro L. (2008) *New biosorbent materials for heavy metal removal: product development guided by active site characterisation* Wat. Res. 42, 2953-2962 doi: 10.1016/j.watres.2008.03.012
28. Martín-Lara M.A., Pagnanelli F., Mainelli S., Calero M., Toro L. (2008) *Chemical treatment of olive pomace: effect on acid-basic properties and metal biosorption capacity* J. Haz. Mater. 156, 448-457 doi: 10.1016/j.jhazmat.2007.12.035
29. Beolchini F., Pagnanelli F., Toro L., Vegliò F. (2008) *A methodologic approach for dynamic modeling of heavy metals biosorption in a ultrafiltration process: a case study on Sphaerotilus natans as biosorbent* International Journal of Environment and Pollution Special issue on Application of biosorbents on wastewater treatments 34(1-4), 325-339 doi: 10.1504/IJEP.2008.020801
30. Pagnanelli F., De Michelis I., Di Muzio S., Ferella F., Veglio F. (2008) *Bioassessment of a combined chemical-biological treatment for synthetic acid mine drainage* J. Haz. Mater. 159(2-3), 567-573 doi: 10.1016/j.jhazmat.2008.02.067
31. Dionisi D., Bornoroni L., Mainelli S., Majone M., Pagnanelli F., Petrangeli Papini M. (2008) *Theoretical and Experimental Analysis of the Role of Sludge Age on the Removal of Adsorbed Micropollutants in Activated Sludge Processes* Industrial & Engineering Chemistry Research 47(17), 6775-6782 doi: 10.1021/ie071280v
32. Beolchini F., Pagnanelli F., De Michelis I., Vegliò F. (2007) *Treatment of concentrated arsenic (V) solutions by micellar enhanced ultrafiltration with high molecular weight cut off membrane* J. Haz. Mater. 148, 116-121 doi: 10.1016/j.jhazmat.2007.02.031
33. Giuliano V., Pagnanelli F., Bornoroni L., Abbruzzese C. (2007) *Toxic elements at a disused mine district: Particle size distribution and total concentration in stream sediments and mine tailings* J. Haz. Mater. 148, 409-418 doi: 10.1016/j.jhazmat.2007.02.063
34. Pagnanelli F., Luigi M., Mainelli S., Toro L. (2007). *Use of natural materials for the inhibition of iron oxidizing bacteria involved in the generation of acid mine drainage* Hydrometallurgy, 87(1-2), 27-35 doi: 10.1016/j.hydromet.2007.01.002

35. Adrover A., Giona M., Pagnanelli F., Toro L. (2007) *Influence of surface heterogeneity in electroosmotic flows-Implications in chromatography, fluid mixing, and chemical reactions in microdevices*. Applied Surface Science 253(13), 5785-5790
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36. Pagnanelli F., Sambenedetto C., Furlani G., Vegliò F., Toro L. (2007) *Preparation and characterisation of chemical manganese dioxide: Effect of the operating conditions*. J. Pow. Sources 166(2), 567-577
doi: 10.1016/j.jpowsour.2007.01.066
37. Beolchini F., Pagnanelli F., Toro L., Vegliò F. (2006) *Ionic strength effect on copper biosorption by Sphaerotilus natans: equilibrium study and dynamic modelling in membrane reactor* Wat. Res. 40(1), 144-152
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38. Pagnanelli F., Bornoroni L., Moscardini E., Toro L. (2006) *Non electrostatic surface complexation models for protons and lead(II) sorption onto single minerals and their mixture* Chemosphere 63 (7), 1063-1073
doi: 10.1016/j.chemosphere.2005.09.017
39. Furlani G., Pagnanelli F., Toro L. (2006) *Reductive acid leaching of manganese dioxide with glucose: identification of oxidation derivatives of glucose* Hydrometallurgy 81, 234–240
doi: 10.1016/j.hydromet.2005.12.008
40. Beolchini F., Pagnanelli F., De Michelis I., Vegliò F. (2006) *Micellar enhanced ultrafiltration for Arsenic(V) removal: effect of the operating conditions and dynamic modelling* Environmental Science & Technology 40(8), 2746-2752
doi: 10.1021/es052114m
41. Beolchini F., Pagnanelli F., Toro L., Vegliò F. (2005). *Continuous biosorption of copper and lead in single and binary systems using Sphaerotilus natans cells confined by a UF/MF membrane reactor: experimental validation of dynamic models* Hydrometallurgy 76(1-2), 73-85
doi: 10.1016/j.hydromet.2004.09.003
42. Pagnanelli F., Mainelli S., De Angelis S., Toro L. (2005). *Biosorption of protons and heavy metals onto olive pomace: modelling of competition effects* Wat. Res. 39(8), 1639-1651
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44. Pagnanelli F., Vegliò F., Toro L. (2004) *Modeling of the acid-base properties of natural and synthetic adsorbent materials used for heavy metal removal from aqueous solutions* Chemosphere, 54(7), 905-915
doi: 10.1016/j.chemosphere.2003.09.003
45. Pagnanelli F., Garavini M., Vegliò F., Toro L. (2004) *Preliminary screening of purification processes of liquor leach solutions obtained from reductive leaching of low grade manganese ore* Hydrometallurgy 71(3-4), 319-327
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46. Beolchini F., Pagnanelli F., Toro L., Vegliò F. (2004) *Copper biosorption by Sphaerotilus natans confined in a UF membrane reactor: experimental study and kinetic modeling* Hydrometallurgy, 72(1-2), 21-30
doi:10.1016/S0304-386X(03)00135-X; IF 1.088
47. Pagnanelli F., Beolchini F., Di Biase A., Vegliò F. (2004) *Biosorption of binary heavy metal systems onto Sphaerotilus natans cells confined in an UF/MF membrane reactor: dynamic simulations by different Langmuir-type competitive models* Wat. Res. 38(4), 1055-1061

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49. Pagnanelli F., Moscardini E., Giuliano V., Toro L. (2004) *Sequential extraction of heavy metals in river sediments of an abandoned pyrite mining area: pollution detection and affinity series* Environmental Pollution, 132(2), 189-201
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50. Pagnanelli F., Bornoroni L., Toro L. (2004) *Proton binding onto soil by a nonelectrostatic surface complexation model: isolation and identification of mineralogical contributions* Environ. Sci. Technol. 38(20), 5443-5449
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52. Adrover A., Velardo A., Giona M., Cerbelli S., Pagnanelli F., Toro L. (2004) *The sporulation model for manganiferous ore dissolution*. Chem. Eng. Sci. 59(22-23), 5107-5112
doi: 10.1016/j.ces.2004.08.031
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doi:10.1016/S0043-1354(02)00358-5
54. Pagnanelli F., Di Biase A., Beolchini F., Vegliò F. (2003) *Effect of equilibrium models on biosorption of heavy metals in single and two stage UF/MF membrane reactor systems*, Biochemical Engineering Journal, 15(1), 27-35
doi:10.1016/S1369-703X(02)00179-1
55. Beolchini F., Pagnanelli F., Toro L., Vegliò F. (2003) *Biosorption of copper by Sphaerotilus natans immobilised in polysulfone matrix: equilibrium and kinetic analysis* Hydrometallurgy, 70(1-3), 101-112
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doi:10.1016/j.ces.2003.08.001
58. Pagnanelli F., Beolchini F., Esposito A., Toro L., Vegliò F. (2003) *Mechanistic modeling of heavy metal biosorption in batch and membrane reactor systems* Hydrometallurgy 71(1-2), 201-208
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63. Pagnanelli F., Toro L., Vegliò F. (2002) *Olive mill solid residues as heavy metal sorbent material: a preliminary study* Waste Management, 22(8), 901-907
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66. Esposito A., Pagnanelli F., Lodi A., Solisio C., Vegliò F. (2001) *Biosorption of heavy metals by Sphaerotilus natans: an equilibrium study at different pH and biomass concentrations*. Hydrometallurgy 60, 129-141.
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67. Vegliò F., Trifoni M., Pagnanelli F., Toro L. (2001) *Shrinking core model with variable activation energy: a kinetic model of manganiferous ore leaching with sulphuric acid and lactose* Hydrometallurgy 60, 167-179.
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68. Beolchini F., Pagnanelli F., Vegliò F. (2001) *Modeling of copper biosorption by Arthrobacter sp. in a UF/MF membrane reactor* Environmental Science & Technology 35, 3048-3054.
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5.1.2 Pubblicazioni su riviste senza IF

- 71 Cruz Viggi C., Pagnanelli F., Mainelli S., Testa V., Cibati A., Toro L. (2008) Treatment of heavy metal's contaminated waters using permeable reactive barriers: from batch to column experiments. Italian Journal Of Engineering Geology And Environment Proceedings pages 37-40. Casa Editrice Università la Sapienza (ISBN 978-88-87242-98-0).
- 72 Ferella F., De Michelis I., Pagnanelli F., Beolchini F., Furlani G., Navarra M.A., Vegliò F., Toro L. (2006). Recovery of Zinc and Manganese from spent batteries by different leaching systems. Acta Metallurgica Slovaca, vol. 12; p. 95-103 (ISSN: 1335-1532)

73 Pagnanelli F., Toro L., Beolchini F., Vegliò F. (2002) Dynamic simulation and experimental validation of mono and multi-component metallic solutions in the biosorption of heavy metals in membrane reactors: an overview European Journal Of Mineral Processing And Environmental Protection Special Issue Biotreatment & Biosorption-I Vol. 2 No. 3, 205-219(ISSN 1303-0868).

5.2 Brevetti

- Pagnanelli Francesca, Granata Giuseppe, Moscardini Emanuela, Toro Luigi (9 May 2014) Process for treating spent photovoltaic panels, PCT/IT2014/000124
- Pagnanelli Francesca, Granata Giuseppe, Moscardini Emanuela, Toro Luigi Processo per il trattamento di pannelli fotovoltaici Brevetto Italiano N° RM2013A000286 (14 Maggio 2013)
- Toro L., Veglio F., Beolchini F., Pagnanelli F., Furlani G., Granata G., Moscardini E.(2013) Impianto e processo per il trattamento di pile e accumulatori esausti Brevetto Italiano N°RM2010A000551
- Toro L., Veglio F., Beolchini F., Pagnanelli F., Furlani G., Granata G., Moscardini E. (2012) Plant and process for the treatment of exhausted accumulators and batteries EP 2450991A1 20120509
- Toro L., Veglio F., Beolchini F., Pagnanelli F., Furlani G., Granata G., Moscardini E. (2012) Recupero di metalli da elettrodi di accumulatori esausti litio ione ed installazione di un impianto mobile per il loro trattamento Brevetto Italiano ITRM20100590 (A1)
- Toro, L.; Vegliò, F.; Beolchini, F.; Pagnanelli, F.; Zanetti, M.; Furlani, G. (2006) Process and plant for the treatment of run-down batteries Eur. Pat. Appl. EPXXDW EP 1684369 A1 20060726.
- Toro, L.; Vegliò, F.; Beolchini F.; Pagnanelli, F.; Zanetti M.; Furlani G. (2004). Processo e impianto per il trattamento di pile esauste Brevetto Italiano N° RM2004A000578

5.3 Capitoli di libri

- Pagnanelli, F. (2011). *Equilibrium, kinetic and dynamic modelling of biosorption processes* Chapter 4 in the Book "Microbial biosorption of metals" Kotrba, Pavel; Mackova, Martina; Macek, Tomas (Eds.) Springer, London ISBN: 978-94-007-0442-8
- Pagnanelli F., De Michelis I., Di Tommaso M., Ferella F., Toro L., Vegliò F. (2008). *Treatment of Acid Mine Drainage by A Combined Chemical/Biological Column Apparatus: Mechanisms of Heavy Metal Removal* Chapter 1 in the Book Causes and Effects of Heavy Metal Pollution (ISBN: 978-1-60456-900-1) Editor: Mikel L. Sánchez, Nova Science Publishers, Inc.
- Pagnanelli F. (2006). *Equilibrium modelling of heavy metal sorption onto natural composite materials*, Chapter 2 in the Book "Focus on Environmental Research" (ISBN: 1-59454-628-2) Editor: E. B. Davis, Nova Science Publishers, Inc.

5.4 Pubblicazioni in congressi

5.4.1 Pubblicazioni in congressi internazionali su atti (in volume con ISBN, CDROM, online)

1. Fabrizio Di Caprio, Pietro Altimari, Luigi Toro, Francesca Pagnanelli (2015) Effect of lipids and carbohydrates extraction on astaxanthin stability in *Scenedesmus* sp. Icheap 15 Chemical Engineering Transactions, vol 43 Chief Editors: SauroPierucci, JiříJ. Klemeš ISBN 978-88-95608-34-1; ISSN 2283-9216
2. Pier Giorgio Schiavi, Pietro Altimari, Francesca Pagnanelli, Emanuela Moscardini, Luigi Toro (2015) Synthesis of Cobalt Nanoparticles by Electrodeposition onto Aluminum Foils Icheap 15 Chemical Engineering Transactions, vol 43 Chief Editors: SauroPierucci, JiříJ. Klemeš ISBN 978-88-95608-34-1; ISSN 2283-9216

3. Francesca Pagnanelli, Emanuela Moscardini, Thomas Abo Atia, Luigi Toro PHOTOVOLTAIC PANEL RECYCLING: FROM TYPE-SELECTIVE PROCESSES TO FLEXIBLE APPARATUS FOR SIMULTANEOUS TREATMENT OF DIFFERENT TYPES Proceedings of the *SHECHTMAN INTERNATIONAL SYMPOSIUM*, 29 June - 04 July 2014 Sustainable Industrial Processing Summit Volume 4 (Recycling, Secondary Battery) pag. 279-294. ISBN CD Set: 978-1-987820-11-9, ISSN: 2291-1200 Editor: Florian Kongoli. Produced in Canada
4. Altimari P., Di Caprio F., Toro L., Capriotti A.L., Pagnanelli F. (2014) Hydrogen photo-production by mixotrophic cultivation of *chlamydomonas reinhardtii*: Interaction between organic carbon and nitrogen Chemical Engineering Transactions 38, 199-204 Selected Articles by invitation from IBIC2014-Industrial Biotechnology International Conference. Rome 8-11 June 2014 DOI:10.3303/CET1438034, ISBN 978-88-95608-29-7; ISSN 2283-9216
5. Altimari, P., Pagnanelli, F., Toro, L.(2013) *Application of structured population balance model for the numerical simulation of a continuous photobioreactor* Chemical Engineering Transactions 32, pp. 1027-1032 (11th International Conference on Chemical & Process Engineering 2-5 June 2013 - Milan, Italy) ISBN 978-88-95608-23-5 ISSN 1974-9791 DOI:10.3303/CET1332172
6. Cruz Viggi C., Pagnanelli F., Toro L. (2011) *Sulphate reduction processes in biological permeable reactive barriers: column experimentation and modeling*. Chemical Engineering Transactions, Volume 24, 1231-1236 Proceedings of ICheaP-10 - The Tenth International Conference on Chemical & Process Engineering Florence, Italy; 8-11 May 2011 (ISBN 978-88-95608-15-0) DOI: 10.3303/CET1124206
7. Trabucco F., Cruz Viggi C., Pagnanelli F., Toro L. (2011) *Development of an integrated process for bio-oil production from microalgae* Chemical Engineering Transactions, Volume 24, 1237-1242 (2011). Proceedings of ICheaP-10 - The Tenth International Conference on Chemical & Process Engineering Florence, Italy; 8-11 May 2011 (ISBN 978-88-95608-15-0 ISSN 1974-9791) Printed in Italy. Edited by Sauro Pierucci DOI: 10.3303/CET1124207
8. Cruz Viggi C., Cibati A., Pagnanelli F., Toro L. (2010) *Modelling of sulphate-reduction processes in biological permeable reactive barriers* XIIth International Mineral Processing Symposium, Nevşehir, Turchia, 6-8 Ottobre 2010 (ISBN 978-975-491-295-1 ISSN 1974-9791) Printed in Italy. Edited by Sauro Pierucci)
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10. Cibati A., Cruz Viggi C., Pagnanelli F., Toro L. (2010) *Innovative biosorbents from agro-industrial wastes* XIIth International Mineral Processing Symposium, Nevşehir, Turchia, 6-8 Ottobre 2010 (ISBN 978-975-491-295-1)
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- Proceedings of Going Green Care Innovation 2014 10th International Symposium and Environmental Exhibition, Schoenbrunn Palace Conference Centre Vienna, Austria 17-20 November 2014.
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