

REFERENCES

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- Akiba, T., Usami, R. and Horikoshi, K. (1983). *Rhodopseudomonas rutila*, a new species of nonsulfur purple photosynthetic bacteria. *Intl. J. Syst. Bacteriol.*, **33**: 551-556.
- Anderson, L. and Fuller, R.C. (1967). Photosynthesis in *Rhodospirillum rubrum*. II. Photoheterotrophic carbon dioxide fixation. *Plant Physiol.*, **42**: 491-496.
- Anton A., Kusnan, M. and Mohd-Hussin, A.R. (1994). Effects of palm oil mill effluent on algae: a laboratory bioassay. In: Algal Biotechnology in the Asia-Pacific Region: Proceedings of the First Asia-Pacific Conference on Algal Biotechnology, 29-31 Jan., 1992, University of Malaya, Kuala Lumpur. Phang S.M., Lee, Y.K., Borowitzka, M.A. and Whitton, B.A. (eds). pp. 320-323.
- APHA, AWWA and WPCF (1989). American Public Health Association, American Water Works Association, Water Pollution Control Federation. Determination of aggregate organic constituents. In: Standard methods for the examination of water and wastewater, 17th edn. Clesceri, L.S., Greenberg, A.E., Trussell, R.R., Franson M.A.H (eds.). Port City Press, Baltimore, Maryland. Part 5000 (5-10 to 5-12).
- Armitage, J.P., Kelly, D.J. and Sockett, R.E. (1995). Flagellate motility, behavioural responses and active transport in purple non-sulfur bacteria. In: Anoxygenic photosynthetic bacteria. Blankenship, R.E., Madigan, M.T. and Bauer, C.E. (eds.). Kluwer Academic Publishers, The Netherlands, pp 1005-1028.
- Atkinson, B., Black, G.M., Lewis, P.J.S. and Pinches, A. (1979). Biological particles of given size, shape and density for use in biological reactors. *Biotechnol. Bioeng.* **21**:193-200.
- Balloni, W., Filpi, C. and Florenzano, G. (1980). Recent trends in the research on wastewater reclamation by photosynthetic bacterial and algal systems. In: Algae biomass. Shelef, G. and Soeder, C.J. (eds.), Elsevier/North-Holland Biomedical Press, London, pp 217-227.
- Balloni, W., Carlozzi, P., Ventura, S., DePhillipis, R. and Bosco, M. (1987). A three years experiment on the production of *Rhodopseudomonas* and *Rhodospirillum* biomass by outdoor culture on different wastes. In: Biomass for energy and industry, 4th E.C. Conference. Proceedings of the international conference, Orleans, France, 11-15th May (1987). Grassi, G.,

- Delmon, B., Molle, J.F., Zibetta, H.J. (eds.), Elsevier Applied Science Publishers Ltd., pp 598-602.
- Bennett, M.A. and Weetall, H.H. (1976). Production of hydrogen using immobilized *Rhodospirillum rubrum*. *J. Solid-phase Biochem.*, **1**: 137-142.
- Bettmann, H. and Rehm, H-J. (1984). Degradation of phenol by polymer entrapped microorganism. *Appl. Microbiol. Biotechnol.*, **20**: 285-290.
- Biebl, H. and Pfennig, N. (1981). In: The Prokaryotes: A handbook on habitats, isolation and identification of bacteria, Vol. I. Starr, M.P., Stolp, H., Trüper, H.G., Balows, A. and Schlegel, H.G. (eds.), Springer-Verlag, New York, pp 267-273.
- Biel, A.J. (1986). Control of bacteriochlorophyll accumulation by light in *Rhodobacter capsulatus*. *J. Bacteriol.*, **168**: 655-659.
- Bisping, B., Hecker, D. and Rehm, H-J. (1989). Glycerol production by semicontinuous fed-batch fermentation with immobilized cells of *Saccharomyces cerevisiae*. *Appl. Microbiol. Biotech.*, **32**: 119-123.
- Bonam, D., Murrell, S.A. and Ludden, P.W. (1984). Carbon monoxide dehydrogenase from *Rhodospirillum rubrum*. *J. Bacteriol.*, **159**: 693-699.
- Bonam, D., Lehman, L., Roberts, G.P. and Ludden, P.W. (1989). Regulation of carbon monoxide dehydrogenase and hydrogenase in *Rhodospirillum rubrum*: Effects of CO and oxygen on synthesis and activity. *J. Bacteriol.*, **171**: 3102-3107.
- Bolliger, R., Zürrer, H. and Bachofen, R. (1985). Photoproduction of molecular hydrogen from waste water of a sugar refinery by photosynthetic bacteria. *Appl. Microbiol. Biotechnol.*, **23**: 147-151.

- Brodelius, P. and van Damme, E.J. (1987). Immobilized cell systems. In: Biotechnology, Vol. 7a. Rehm H.J. and Reed, G. (eds), VCH Publishers, Germany, pp. 405-464.
- Bucke, C. (1987). Methods in enzymology. In: Immobilized enzymes and cells, Vol. 135. Mosbach, K. (ed), Academic Press, Orlando, pp 175-189.
- Buranakarl, L., Ying, F.C., Ito, K., Izaki, K. and Takahashi, H. (1985). Production of molecular hydrogen by photosynthetic bacteria with raw starch. *Agric. Biol. Chem.*, **49**: 3339-3341.
- Burgess, J.G., Kawaguchi, R., Yamada, A. and Matsunaga, T. (1994). *Rhodobacter marinus* sp. nov. : A new marine hydrogen producing photosynthetic bacterium which is sensitive to oxygen and sulphide. *Microbiology*, **140**: 965-970.
- Carr, N.G. (1969). Growth of phototrophic bacteria and blue-green algae. In: Methods in microbiology. Norris, J.R. and Ribbons, D.W. (eds.), Academic Press, New York, pp 53-77.
- Chibata I. (1978). Immobilized enzymes. John Wiley & Sons, Inc., New York, pp 54.
- Chibata, I., Tosa, T. and Sato, T. (1974). Immobilized aspartase-containing microbial cells: Preparation and enzymatic properties. *Appl. Microbiol.*, **27**: 878-885.
- Cochet, N., Lebeault, J.M. and Vijayalakshmi, M.A. (1990). Physicochemical aspects of cells adsorption. In: Wastewater treatment by immobilized cells. Tyagi, R.D. and Vembu, K. (eds.), CRC Press, Boca Raton, Florida, pp 1-28.

- Cohen-Bazire, G., Sistrom, W.R. and Stanier, R.Y. (1957). Kinetic studies of pigment synthesis by non-sulfur purple bacteria. *J. Cell Comp. Physiol.*, **49**: 25-68.
- Collins, C.H. and Lyne, P.M. (1984). Microbiological methods. 5th edn, Butterworths, London, pp 98.
- Dow, C.S. (1982). Experiments with photosynthetic bacteria. In: Sourcebook of experiment for the teaching of microbiology. Primrose, S.B. and Wardlaw, A.C. (eds), Academic Press, New York, pp. 408-422.
- Dutton, P.L. and Evans, W.C. (1969). The metabolism of aromatic compounds by *Rhodopseudomonas palustris*. *J. Biochem.*, **113**: 525-536.
- Elder, D.J.E., Morgan, P. and Kelly, D.J. (1992). Anaerobic degradation of *trans*-cinnamate and ω -phenylakane carboxylic acids by the photosynthetic bacterium *Rhodopseudomonas palustris*: Evidence for a β -oxidation mechanism. *Arch. Microbiol.*, **157**: 148-154.
- Favinger, J., Stadtwald, B. and Gest, H. (1989). *Rhodospirillum centenum* sp. nov., a thermotolerant cyst-forming photosynthetic bacterium. *Antonie van Leeuwenhoek*, **55**: 291-296.
- Fißler, J., Schirra, C., Kohring, G.W. and Giffhorn, F. (1994). Hydrogen production from aromatic acids by *Rhodopseudomonas palustris*. *Appl. Microbiol. Biotechnol.*, **41**: 395-399.
- Fißler, J., Kohring, G.W. and Giffhorn, F. (1995). Enhanced hydrogen production from aromatic acids by immobilized cells of *Rhodopseudomonas palustris*. *Appl. Microbiol. Biotechnol.*, **44**: 43-46.

- Francou, N. and Vignais, P.M. (1984). Hydrogen production by *Rhodopseudomonas capsulata* cells entrapped in carrageenan beads. *Biotechnol. Lett.*, **6**: 639-644.
- Friscow, N.N. and Drews, G. (1977). Differentiation of the intracytoplasmic membrane of *Rhodopseudomonas palustris* induced by variations of oxygen partial pressure or light intensity. *Arch. Microbiol.*, **115**: 299-306.
- Fujii, T., Honda, Y., Ando, A. and Yabuki, M. (1982). Microbial growth on a medium containing methanol and bicarbonate under anaerobic conditions in the light. *Argic. Biol. Chem.*, **46**: 2209-2215.
- Fukui, S. and Tanaka, A. (1982). Immobilized microbial cells. *Ann. Rev. Microbiol.*, **36**: 145-172.
- Fuller, R.C., Smillie, R.M., Sisler, E.C. and Kornberg, H.L. (1961). Carbon metabolism in Chromatium. *J. Biol. Chem.*, **236**: 2140-2149.
- Geetha, P.K., Phang, S.M., Hashim, M.A. and Blakebrough, N. (1994). Rubber effluent treatment in a high rate algal pond system. In: Algal Biotechnology in the Asia-Pacific Region: Proceedings of the First Asia-Pacific Conference on Algal Biotechnology, 29-31 Jan., 1992, University of Malaya, Kuala Lumpur. Phang S.M., Lee, Y.K., Borowitzka, M.A. and Whitton, B.A. (eds) pp. 306-308.
- Geissler, J.F., Harwood, C.S. and Gibson, J. (1988). Purification and properties of benzoate-coenzyme A ligase, a *Rhodopseudomonas palustris* enzyme involved in the anaerobic degradation of benzoate. *J. Bacteriol.*, **170**: 1709-1714.
- Gest, H. (1981). Evolution of the citric acid cycle and respiratory energy conversion in prokaryotes. *FEMS Microbiol. Lett.*, **12**: 209-215.
- Gest, H. and Kamen, M.D. (1949). Photoproduction of molecular hydrogen by *Rhodospirillum rubrum*. *Science* **109**: 558-559.
- Gest, H., Favinger, J.L. and Madigan, M.T. (1985). Exploitation of N₂-fixation capacity for enrichment of anoxygenic photosynthetic bacteria in ecological studies. *FEMS Microbiol. Ecol.*, **31**: 317-322.

- Getha, K. (1995). Growth and production of the phototrophic bacterium *Rhodopseudomonas palustris* strain B1 in sago starch processing wastewater. M. Biotech. Thesis, Institute of Advanced Studies, University of Malaya, Kuala Lumpur, Malaysia.
- Gibson, J. (1975). Uptake of C₄ dicarboxylates and pyruvate by *Rhodopseudomonas sphaeroides*. *J. Bacteriol.*, **123**: 471-480.
- Gibson, J. (1995). Degradation of aromatic compounds by nonsulfur purple bacteria. In: Anoxygenic photosynthetic bacteria. Blankenship R.E., Madigan, M.T. and Bauer, C.E. (eds.), Kluwer Academic Publishers, The Netherlands, pp 991-1003.
- Gorlenko, V.M., Kompanseva, E.I. and Puchkova, N.N. (1985). Influence of temperature on prevalence of phototrophic bacteria in hot springs. *Mikrobiologiya*, **54**: 848-853.
- Gorlenko, V.M., Bonch-Osmolovskaya, E.A., Kompanseva, E.I. and Starynin, D.A. (1987). Differentiation of microbial communities in connection with a change in the physicochemical conditions in thermophile spring. *Mikrobiolgiya*, **56**: 314-322.
- Gosman, B. and Rehm, H-J. (1988). Influence of growth behaviour and physiology of alginic-entrapped microorganisms on the oxygen consumption. *Appl. Microbiol. Biotechnol.*, **29**: 554-559.
- Grist, N.R., Bell, E.J., Follett, E.A.C. and Urquhart, G.E.D. (1979). Cell culture. In: Diagnostic methods in clinical virology. 3rd edn, Blackwell Scientific Publications, Great Britain, pp 60-80.

- Hallenbeck, P.L., Lerchen, R., Hessler, P. and Kaplan, S. (1990). Roles of CfxA, CfxB and external electron acceptors in regulation of ribulose 1,5-bisophosphate carboxylase/oxygenase expression in *Rhodobacter iza*. *J. Bacteriol.*, **172**: 1736-1748.
- Hamblin, M.J., Shaw, J.G., Curson, J.P. and Kelly, D.J. (1990). Mutagenesis, cloning and complementation analysis of C₄-dicarboxylate transport genes from *Rhodobacter capsulatus*. *Mol. Microbiol.*, **4**: 1567-1574.
- Hansen, T.A. and van Gemerden, H. (1972). Sulfide utilization by purple nonsulfur bacteria. *Arch. Microbiol.*, **86**: 49-56.
- Harwood, C.S. and Gibson, J. (1988). Anaerobic and aerobic metabolism of diverse aromatic compounds by the photosynthetic bacterium *Rhodopseudomonas palustris*. *Appl. and Environ. Microbiol.*, **54**(1): 712-717.
- Hillmer, P. and Gest, H. (1977a). H₂ metabolism in the photosynthetic bacterium *Rhodopseudomonas capsulata*: H₂ production by growing cultures. *J. Bacteriol.*, **129**(2): 724-731.
- Hillmer, P. and Gest, H. (1977b). H₂ metabolism in the photosynthetic bacterium *Rhodopseudomonas capsulata*: Production and utilization of H₂ by resting cells. *J. Bacteriol.*, **129**: 732-739.
- Hiraishi, A. and Ueda, Y. (1994a). Intrageneric structure of the genus *Rhodobacter*. Transfer of *Rhodobacter sulfidophilus* and related marine species to the genus *Rhodovulum* gen. nov. *Int. J. Syst. Bacteriol.*, **44**: 15-23.
- Hiraishi, A. and Ueda, Y. (1994b). *Rhodoplanes* gen. nov., a new genus of phototrophic bacteria including *Rhodopseudomonas rosea* as *Rhodoplanes*

- roseus* comb. nov. and *Rhodoplanes elegans* sp. nov. *Intl. J. Syst. Bacteriol.*, **44**: 665-673.
- Hirayama, O., Uya, K., Hiramatsu, Y., Yamada, H. and Moriwaki, K. (1986). Photoproduction of hydrogen by immobilized cells of a photosynthetic bacterium, *Rhodospirillum rubrum* G-9 BM. *Agric. Biol. Chem.*, **50**(4): 891-897.
- Hirsch, P. (1968). Photosynthetic bacterium growing under carbon monoxide. *Nature*, **217**: 555-556.
- Hutber, G.N. and Ribbons, D.W. (1983). Involvement of coenzyme A Esters in the metabolism of Benzoate and cyclohexane carboxylate by *Rhodopseudomonas palustris*. *J. Gen. Microbiol.*, **129**: 2413-2420.
- Ikemoto, H. and Mitsui, A. (1984). Continuous hydrogen production from sulfide by an immobilized marine photosynthetic bacterium, *Chromatium* sp. Miami PBS 1071. In: Advances in Photosynthesis Research Vol. II, Sybesma, C. (ed.), The Hague, Boston Lancaster, pp 789-792.
- Imhoff, J.F. (1982). Response of photosynthetic bacteria to mineral nutrients. In: CRC handbook of biosolar resources. Vol. I, Part 2. Mitsui, A. and Black, C.C. (eds). CRC Press Inc., Boca Raton, Florida, pp 135-146.
- Imhoff, J.F. (1992). Taxonomy, phylogeny and general ecology of anoxygenic phototrophic bacteria. In: Photosynthetic Prokaryotes. Mann, N.H. and Carr, N.G. (eds), Plenum Press, New York, pp 53-92.
- Imhoff, J.F. (1995). Taxonomy and physiology of phototrophic purple bacteria and green sulfur bacteria. In: Anoxygenic photosynthetic bacteria. Blakenship, R.E., Madigan, M.T. and Bauer, C.E. (eds.), Kluwer Academic Publishers, The Netherlands, pp 1-15.

- Imhoff, J.F. and Trüper, H.G.. (1989). The purple nonsulfur bacteria. In: Bergey's manual of systematic bacteriology, Vol. 3. Staley, J.T., Bryant, M.P., Pfennig, N. and Holt, J.C. (eds.), Williams and Wilkins, Baltimore, pp 1658-1661.
- Jensen, S.C. and Jensen, A. (1971). Quantitative determination of carotenoids in photosynthetic tissues. In: Methods in enzymology, Vol. 23. Pietro, A.S. (ed.), Academic Press, New York, pp 586-602.
- Jouanneau, Y., Wong, B. and Vignais, P.M. (1985). Stimulation by light of nitrogenase synthesis in cells of *Rhodopseudomonas capsulata* growing in N-limited continuous culture. *Biochem. Biophys. Acta*, **808**: 149-155.
- Juliano, B.O. (1985). Rice starch: Production, properties and uses. In: Starch, chemistry and technology, 2nd edn. Whistler, R.L., Bemiller, J.N. and Paschall, E.F. (eds.), Academic Press Inc., pp 249-274.
- Kamal, V.S. and Wyndham, R.C. (1990). Anaerobic phototrophic metabolism of 3-chlorobenzoate by *Rhodopseudomonas palustris* WS17. *Appl. and Environ. Microb.*, **56**: 3871-3873.
- Kamen, M.D. and Gest, H. (1949). Evidence for a nitrogenase system in the photosynthetic bacterium *Rhodospirillum rubrum*. *Science*, **109**: 560.
- Kampf, C. and Pfennig, N. (1980). Capacity of *Chromatiaceae* for chemotrophic growth. Specific respiration rates of *Thiocystis violacea* and *Chromatium vinosum*. *Arch. Microb.*, **127**: 125-135.
- Karube, I., Matsuoka, H., Murata, H., Kajiwara, K. and Suzuki, S. (1984). Large-scale bacteria fuel cell using immobilized photosynthetic bacteria. *Ann. N.Y. Acad. Sci.*, pp. 434-427.

- Kawasaki, H., Hoshino, Y., Kuraishi, H. and Yamasoto, K. (1992). *Rhodocista centenaria* gen. nov., sp. nov., a cyst-forming anoxygeric photosynthetic bacterium and its phylogenetic position in the *Proteobacteria alpha* group. *J. Gen. Appl. Microbiol.*, **38**: 541-551.
- Kawasaki, H., Hoshino, Y., Hirata, A. and Yamasato, K. (1993). Is intracytoplasmic membrane structure a genetic criterion? It does not coincide with phylogenetic interrelationships among phototrophic purple nonsulfur bacteria. *Arch. Microb.*, **160**: 358-362.
- Khanna, P., Rajkumar, B. and Jothikumar, N. (1992). Anoxygenic degradation of aromatic substances by *Rhodopseudomonas palustris*. *Current Microbiol.*, **25**: 63-67.
- Kim, J.S., Ito, K. and Takahashi, H. (1982a). Production of molecular hydrogen in outdoor batch cultures of *Rhodopseudomonas sphaeroides*. *Agric. Biol. Chem.*, **46**(4): 937-941.
- Kim, J.S., Yamauchi, H., Ito, K. and Takahashi, H. (1982b). Selection of a photosynthetic bacterium suitable for hydrogen production in outdoor cultures among strains isolated in the Seoul, Taegu, Sendai and Bangkok areas. *Agric. Biol. Chem.*, **46**(6): 1469-1474.
- Klasson, K.T., Lundback, K.M.O., Clausen, E.C. and Gaddy, J.L. (1993). Kinetics of light-limited growth and biological hydrogen production from carbon monoxide and water by *Rhodospirillum rubrum*. *J. Biotech.*, **29**: 177-188.
- Kobayashi, M. (1982). The role of phototrophic bacteria in nature and their utilization. In: Advances in agricultural microbiology. Rao, N.S.S. (ed.) Butterworth Scientific, London, pp 643-661.

- Kobayashi, M. and Haque, M.Z. (1971). Contribution to nitrogen fixation and soil fertility by photosynthetic bacteria. *Plant and Soil*, special volume, p 443-456.
- Kobayashi, M. and Kurata, S. (1978). The mass culture and cell utilization of photosynthetic bacteria. *Proc. Biochem.*, **13**: 27-30.
- Kobayashi, M. and Kondo, M. (1984). The role of phototrophic bacteria in nature and the utilization. The Third International Symposium on our Environment. 27-29th March, Singapore.
- Kobayashi, M. and Kobayashi, M. (1995). Waste remediation and treatment using anoxygenic phototrophic bacteria. In: Anoxygenic photosynthetic bacteria. Blakenship, R.E., Madigan, M.T., Bauer, C.E. (eds.), Kluwer Academic Publishers, The Netherlands, pp 1269-1282.
- Kolot, F.B. (1981). Microbial carriers. *Proc. Biochem.* **16**: 30-33.
- Kompantseva, E.J. and Gorlenko, V.M. (1984). A new species of moderately halophilic purple bacterium *Rhodospirillum mediosalinum* sp. nov. *Microbiologiya*, **53**: 775-781.
- Kondratieva, E.N. and Krasil'nikova, E.N. (1981). Reduction of nitrates by purple bacteria under various conditions of growth. *Mikrobiologiya*, **50**: 1066-1070.
- Kosaric, N. and Lyng, R.P. (1988). Microbial production of hydrogen. In: Biotechnology, Vol. 6B. Rehm, A.J. and Reed, G. (eds), VCH Publishers, Germany, pp 101-134.
- Kuu, W.Y. and Polack, J.A. (1983). Improving immobilized biocatalysts by gel phase polymerization. *Biotechnol. Bioeng.*, **25**: 1995.

- Kuver, J., Xu, Y. and Gibson, J. (1995). Metabolism of cyclohexane carboxylic acid by the photosynthetic bacterium *Rhodoseudomonas palustris*. *Arch. Microbiol.*, **164**: 337-345.
- Lascelles, J. (1960). The synthesis of enzymes concerned in bacteriochlorophyll formation in growing cultures of *Rhodospseudomonas sphaeroids*. *J. Gen. Microbiol.*, **23**: 487-498.
- Madigan, M.T. (1988). Microbiology, physiology and ecology of phototrophic bacteria. In: Biology of anaerobic microorganisms. Zehnder, A.J.B. (ed.), John Wiley and Sons, Inc., New York, pp 39-111.
- Madigan, M.T. and Gest, H. (1979). Growth of the bacterium *Rhodopseudomonas capsulata* chemolithotrophically in darkness with H₂ as the energy source. *J. Bacteriol.*, **137**: 524-530.
- Madigan, M.T. and Gest, H. (1988). Selective enrichment and isolation of *Rhodopseudomonas palustris* using *trans*-cinnamic acid as sole carbon source. *FEMS Microbiol. Ecol.*, **53**: 53-58.
- Mangels, L.A., Favinger, J.L., Madigan, M.T. and Gest, H. (1986). Isolation and characterization of the N₂-fixing marine photosynthetic bacterium *Rhodopseudomonas marina*, variety *agilis*. *FEMS Microbiol. Ecol.*, **36**: 99-104.
- Marcipar, A., Cochet, N., Brackenridge, L. and Labault, J.M. (1978). Immobilization of yeasts on ceramic supports. *Biotechnol. Lett.*, **1**: 65-70.
- Matsunaga, T. and Mitsui, A. (1982). Seawater-based hydrogen production by immobilized marine photosynthetic bacteria. *Biotechnol. Bioeng. Symp.*, **12**: 441-450.

- Mignot, L., Planchard, A., Jouenne, T. and Junter, G.A. (1987). Entrapment and long-term conservation of microbial activity by using composite gel/membrane structures. In: Proceedings of the 4th European Congress on Biotechnology, Vol. 2. Neijssel O.M., van der Meer, R.R., Luyben K.Ch.A.M. (eds.), Elsevier, 14-19 June 1987, Amsterdam.
- Mitsui, A., Ohta, Y., Frank, J., Kumazawa, S., Hill, C., Rosner, D., Barciella, S., Greenbaum, J., Haynes, L., Oliva, L., Dalton, P., Radway, J. and Giffard, P. (1980). In: Alternative energy sources II, Vol. 8. Veziroglu, T.N. (ed.). Hemisphere Publications, Washington D.C., pp 3483-3510.
- Mosbach, K. and Mosbach, R. (1966). Entrapment of enzymes and microorganism in synthetic cross-linked polymers and their application in column techniques. *Acta Chem. Scand.*, **20**: 2807-2810.
- Muller, F.M. (1933). On the metabolism of the purple sulfur bacteria in organic media. *Arch. Microbiol.*, **4**: 131-166.
- Neufeld, R.J., Peleg, Y., Robem, J.S., Pines, O. and Goldberg, J. (1991). L-malic acid formation by immobilized *Saccharomyces cerevisiae* amplified for fumarase. *Enzy. Microb. Technol.*, **13**: 991-996.
- Noparatnaraporn, N. (1994). Photosynthetic bacteria and its application in agriculture. Paper presented at the International Symposium on Bioproducts Processing, 4-7th January, Kuala Lumpur.
- Noparatnaraporn, N. Nishizawa, Y., Hayashi, M. and Nagai, S. (1983). Single cell protein production from cassava starch by *Rhodopseudomonas gelatinosa*. *J. Ferment. Technol.*, **61**: 515-519.

- Noparatnaraporn, N., Wongkornchawalit, W., Kantachote, D. and Nagai, S. (1986). SCP production of *Rhodopseudomonas sphaeroides* on pineapple wastes. *J. Ferment. Technol.*, **64**: 132-143.
- Noparatnaraporn, N., Trakulnaleumsai, S., Silveira, R.G., Nishizawa, Y. and Nagai, S. (1987). SCP production by mixed culture of *Rhodopseudomonas gelatinosus* and *Rhodobacter sphaeroides* from cassava waste. *J. Ferment. Technol.*, **65**: 11-16.
- Nordin, J.S., Tsuchiya, A.M. and Frederickson, A.G. (1967). Interfacial phenomena governing adhesion of *Chlorella* to glass surfaces. *Biotechnol. Bioeng.*, **9**: 545-558.
- Ormerod, J.G. and Sirevag, R. (1983). In: The photosynthetic bacteria: An anaerobic life in the light. Carr, N.G., Ingraham, J.L. and Rittenberg, S.C. (eds.) Blackwell, Oxford and London, pp 215-236.
- Ormerod, J.G., Ormerod, K.S. and Gest, H. (1961). Light-dependent utilization of organic compounds and photoproduction of molecular hydrogen by photosynthetic bacteria; Relationships with nitrogen metabolism. *Arch. Biochem. Biophys.*, **94**: 449-463.
- Pfennig, N. (1967). Photosynthetic bacteria. *Ann. Rev. Microbiol.*, **21**: 285-324.
- Pfennig, N. (1969). *Rhodopseudomonas acidophila*, sp. n., a new species of the budding purple nonsulfur bacteria. *J. Bacteriol.*, **99**: 597-602.
- Pfennig, N. (1974). *Rhodopseudomonas globiformis*, sp.n., a new species of the *Rhodospirillaceae*. *Arch. Microbiol.*, **100**: 197-206.
- Pfennig, N. (1977). Phototrophic green and purple bacteria: a comparative and systematic survey. *Ann. Rev. Microbiol.*, **31**: 275-290.

- Pfennig, N. (1978). *Rhodocyclus purpureus* gen. nov. and sp. nov., a ring-shaped, vitamin B12-requiring member of the family *Rhodospirillaceae*. *Int. J. Syst. Bacteriol.*, **28**: 283-288.
- Pfennig, N. and Trüper, H.G. (1974). The phototrophic bacteria. In: Bergey's manual of determinative bacteriology, 8th edn. Buchanan, R.E. and Gibbons, N.E. (eds.) Williams and Wilkins, Baltimore, Maryland, pp 24-64.
- Pfennig, N. and Truper, H.G. (1991). The family Chromatiaceae. In: The prokaryotes. Vol. IV, 2nd edn. Ballows,A., Truper, H.G., Dworkin, M., Harder, W. and Schleifer, K.H. (eds.), Springer-Verlag, New York, pp 3200-3221.
- Phillips, C.R. and Poon, Y.C. (1988). Immobilization of cells. In: Biotechnology monographs, Vol. 5. Aiba, S., Fan, L.T., Fiechter, A., Klein, J. and Schugerl, K. (eds). Springer-Verlag, New York.
- Philips, E.J. and Mitsui, A. (1982a). Light intensity preference and tolerance of aquatic photosynthetic microorganisms. In: CRC handbook of biosolar resources, Vol.I, Part 2. Mitsui, A. and Black, C.C. (eds). CRC Press Inc., Boca Raton, Florida.
- Philips, E.J. and Mitsui, A. (1982b). Temperature preference and tolerance of aquatic photosynthetic microorganisms. In: CRC handbook of biosolar resources. Vol. I, Part 2. Mitsui, A. and Black, C.C. CRC Press Inc., Boca Raton, Florida.
- Planchard, A., Mignot, L., Jouenne, T. and Junter, G. (1989). Photoproduction of molecular hydrogen by *Rhodospirillum rubrum* immobilized in composite agar layer/microporous membrane structures. *Appl. Microbiol. Biotechnol.*, **31**: 49-54.

- Prasertsan, P. Choorit, W. and Suwanno, S. (1993). Optimization for growth of *Rhodocyclus gelatinosus* in seafood processing effluents. *World J. Microbiol. Biotechnol.*, **9**: 593-596.
- Qadri, H.S.M. and Hoare, D.S. (1968). Formic hydrogenlyase and the photoassimilation of formate by a strain of *Rhodopseudomonas palustris*. *J. Bacteriol.*, **95**(6): 2344-2357.
- Quayle, J.R. and Pfennig, N. (1975). Utilization of methanol by *Rhodospirillaceae*. *Arch. Microbiol.*, **102**: 193-198.
- Rehm, H.-J. and Omar, S.H. (1993). Special morphological and metabolic behaviour of immobilized microorganisms. *Biotechnology*, Vol. I, 2nd edn. Rehm, H.-J. and Reed, G. (eds.) VCH Publishers Inc., New York, pp 224-248.
- Resnick, S.M. and Madigan, M.T. (1989). Isolation and characterization of a mildly thermophilic nonsulfur purple bacterium containing bacteriochlorophyll b. *FEMS Microbiol. Lett.*, **65**: 165-170.
- Rolls, J.P. and Lindstrom, E.S. (1967a). Induction of a thiosulfate-oxidising enzyme in *Rhodopseudomonas palustris*. *J. Bacteriol.*, **94**(3): 784-785.
- Rolls, J.P. and Lindstrom, E.S. (1967b). Effect of thiosulfate on the photosynthetic growth of *Rhodopseudomonas palustris*. *J. Bacteriol.*, **94**(4): 860-866.
- Rosevear, A. (1984). Immobilized biocatalysts - A critical review. *J. Chem. Technol. Biotechnol.*, **34B**: 127.
- Rosevear, A., Kennedy, J.F. and Cabral, J.M.S (1987). Immobilized enzymes and cells. Adam Hilger, Bristol and Philadelphia.

- Sasaki, K., Noparatnaraporn, N. Hayashi, M., Nishizawa, Y. and Nagai, S. (1981). Single-cell protein production by treatment of soybean wastes with *Rhodopseudomonas gelatinosa*. *J. Ferment. Technol.*, **59**(6): 471-477.
- Sasaki, K., Noparatnaraporn, N. and Nagai, S. (1991). Use of photosynthetic bacteria for the production of SCP and chemicals from agroindustrial wastes. In: Bioconversion of waste materials to industrial products. Martin, A.M. (ed). Elsevier Applied Science, pp. 225-264.
- Sasikala, K., Ramana, Ch.V., Rao, P.R. and Subrahmanyam, M. (1990). Photoproduction of hydrogen, nitrogenase and hydrogenase activities of free and immobilized whole cells of *Rhodobacter sphaeroides* O.U.001. *FEMS Microbiol. Lett.*, **72**: 23-28.
- Sasikala, K., Ramana, Ch. V. and Raghveer Rao, P. (1992). Photoproduction of hydrogen from wastewaters of a distillery by *Rhodobacter sphaeroides* O.U.001. *Int J. Hydrogen Energy.*, **17**: 23-27.
- Sasikala, K., Ramana, Ch. V., Raghureer Rao, P. and Kovacs, K.L. (1993). Anoxygenic phototrophic bacteria: Physiology and advances in hydrogen production technology. *Adv. Appl. Microbiol.*, **28**: 211-295.
- Sawada, H. and Rogers, P.L. (1977). Photosynthetic bacteria in waste treatment: Pure culture studies with *Rhodopseudomonas capsulata*. *J. Ferment. Technol.*, **55**(4): 297-310.
- Schmidt, K. (1978). Biosynthesis of carotenoids. In: The photosynthetic bacteria. Clayton, R.K. and Sistrom, W.R. (eds.) Plenum Press, New York, pp 729-750.
- Shaw, J.G. and Kelly, D.J. (1991). Binding-protein dependent transport of C4-dicarboxylates in *Rhodobacter capsulatus*. *Arch. Microb.*, **155**: 466-472.

- Shim, Y.K. (1992). Utilization of sago hampas by microfungi. M. Biotech. thesis, Institute of Advanced Studies, University of Malaya, Kuala Lumpur, Malaysia.
- Shinmyo, A., Kimura, H. and Okada, H. (1982). Physiology of α -amylase production by immobilized *Bacillus amyloliquefaciens*. *Eur. J. Appl. Microbiol. Biotechnol.*, **14**: 7-12.
- Shipman, R.H., Kao, I.C. and Fan, L.T. (1975). Single-cell protein production by photosynthetized bacteria cultivation in agriculture by-products. *Biotechnol. Bioeng.*, **17**: 1561-1570.
- Siefert, E. and Pfennig, N (1979). Chemoautotrophic growth of *Rhodopseudomonas* species with hydrogen and chemotrophic utilization of methanol and formate. *Arch. Microbiol.*, **122** : 177 -182.
- Singh, S.P., Srivastava, S.C. and Pandey, K.D. (1990). Photoproduction of hydrogen by a non-sulphur bacterium isolated from root zones of water fern *Azolla pinnata*. *Int. J. Hydrogen Energy*, **15**: 403-406.
- Sojka, G.A., Freeze, H.H. and Gest, H. (1970). Quantitative estimation of bacteriochlorophyll *in situ*. *Acta Biochem. Biophys.*, **136**: 578-580.
- Stadtwald-Demchick, R., Turner, F.R. and Gest, H. (1990a). Physiological properties of the thermotolerant photosynthetic bacterium, *Rhodospirillum centenum*. *FEMS Microbiol. Lett.*, **67**: 139-144.
- Stadtwald-Demchick, R., Turner, F.R. and Gest, H. (1990b). *Rhodopseudomonas cryptolactis*, sp. nov., a new thermotolerant species of budding phototrophic purple bacteria. *FEMS Microbiol. Lett.*, **71**: 117-122.

- Tabita, R.F. (1995). The biochemistry and metabolic regulation of carbon metabolism and CO₂ fixation in purple bacteria. In: Anoxygenic photosynthetic bacteria. Blackenship, R.E., Madigan, M.T. and Bauer, C.E. (eds.) Kluwer Academic Publishers, The Netherlands, pp 885-914.
- Tosa, T., Sato, T., Mori, T., Yamamoto, K., Takata, I., Nishida, Y. and Chibata, I. (1979). Immobilization of enzymes and microbial cells using carrageenan as matrix. *Biotechnol. Bioeng.*, **21**: 1697-1709.
- Trüper, H.G. and Pfennig, N. (1981). Characterization and identification of the anoxygenic phototrophic bacteria. In: The prokaryotes. Starr, M.P., Stolp, H., Trüper, H.G., Balows, A. and Schlegel, H.G. (eds.) Springer-Verlag, New York, pp 299-312.
- Uffen, R.I. (1976). Anaerobic growth of a *Rhodopseudomonas* species in the dark with carbon monoxide as sole source of carbon and energy source. *Proc. Natl. Acad. Sci. USA*, **73**: 3298-3302.
- van Niel, C.B. (1944). The culture, general physiology, morphology and classification of the non-sulfur purple and brown bacteria. *Bacteriol. Rev.*, **8**: 1-118.
- van Loosdrecht, M.C.M., Lyklema, J., Norde, W. and Zehnder, A.J.B. (1990). Influences of interfaces on microbial activity. *Microbiol. Rev.*, **54**: 75-87.
- van Niel, C.B. (1944). The culture, general physiology, morphology and classification of the non-sulfur purple and brown bacteria. *Bacteriol. Rev.*, **8**: 1-118.
- Vatsala, T.M. and Ramasamy, V. (1989). Alternative Energy Sources, VIII, Vol. 2. Veziroglu, T.N. (ed.) Hemisphere Publ., New York, pp 519-529.

- Venkatasubramaniam, K. and Vieth, W.R. (1979). Immobilized microbial cells. *Prog. Ind. Microbiol.*, **15**: 61-86.
- Veziroglu, T.N. (1987). Hydrogen technology for energy needs of human settlements. *Int. J. Hydrogen Energy*, **12**: 99-129.
- Vijaya, N. (Personal Communications, 1996).
- Vincenzini, M., Balloni, W., Mannelli, D. and Florenzano, G. (1981). A bioreactor for continuous treatment of waste waters with immobilized cells of photosynthetic bacteria. *Experientia*, **37**: 710-711.
- Vincenzini, M., Materassi, R., Tredici, M.R. and Florenzano, G. (1982a). Hydrogen production by immobilized cells. I. Light dependent dissimilation of organic substances by *Rhodopseudomonas palustris*. *Int. J. Hydrogen Energy*, **7**(3): 231-236.
- Vincenzini, M., Materassi, R., Tredici, M.R. and Florenzano, G. (1982b). Hydrogen production by immobilized cells. II. H₂-photoevolution and waste-water treatment by agar-entrapped cells of *Rhodopseudomonas palustris* and *Rhodospirillum molischianum*. *Int. J. Hydrogen Energy*, **7**(9): 725-728.
- Vincenzini, M., Materassi, R., Sili, C. and Florenzano, G. (1986). Hydrogen production by immobilized cells. III. Prolonged and stable H₂ photoevolution by *Rhodopseudomonas palustris* in light-dark cycles. *Int. J. Hydrogen Energy*, **11**(10): 623-626.
- von Felten, P., Zürrer, H. and Bachofen, R. (1985). Production of molecular hydrogen with immobilized cells of *Rhodospirillum rubrum*. *Appl. Microbiol. Biotechnol.*, **23**: 15-20.

- Vrati, S. (1984). Single cell protein production by photosynthetic bacteria grown on the clarified effluents of biogas plant. *Appl. Microbiol. Biotechnol.*, **19**: 199-202.
- Vrati, S. and Verma, J. (1983). Production of molecular hydrogen and single cell protein by *Rhodopseudomonas capsulata* from cow dung. *J. Ferment. Technol.*, **61**: 157-162.
- Watanabe, K., Kim, J.S., Ito, K., Buranakarl, L., Kampee, T. and Takahashi, H. (1981). Thermostable nature of hydrogen production by non-sulfur purple photosynthetic bacteria isolated in Thailand. *Agric. Biol. Chem.*, **45**(1): 217-222.
- Weaver, P.F., Wall, J.D. and Gest, H. (1975). Characterization of *Rhodopseudomonas capsulata*. *Arch. Microbiol.*, **105**: 207-216.
- Westmacott, D. and Primrose, S.B. (1976). Synchronous growth of *Rhodopseudomonas palustris* from the swarmer phase. *J. Gen. Microbiol.*, **94**: 117-125.
- Westrin, B.A. and Axelsson, A. (1991). Diffusion in gels containing immobilized cells: A critical review. *Biotech. Bioeng.*, **38**: 439-446.
- Widdel, F., Schnell, S., Heising, S., Ehrenreich, A., Assmus, B. and Schink, B. (1993). Ferrous iron oxidation by anoxygenic phototrophic bacteria. *Nature*, **362**: 834-836.
- Willison, J.C., (1993). Biochemical genetics revisited: The use of mutants to study carbon and nitrogen metabolism in the photosynthetic bacteria. *FEMS Microbiol. Rev.*, **104**: 1-38.

- Willison, J.C., Madern, D. and Vignais, P.M. (1984). Increased photoproduction of hydrogen by non-autotrophic mutants of *Rhodopseudomonas capsulata*. *J. Biochem.*, **219**: 593-600.
- Wright, G.E. and Madigan, M.T. (1991). Photocatabolism of aromatic compounds by the phototrophic purple bacterium *Rhodomicrobium vanielli*. *Appl. Environ. Microbiol.*, **57**: 2069-2073.
- Yang, P.Y. and Wang, M.L. (1990). Entrapment of microbial cells for wastewater treatment. In: Wastewater treatment by immobilized cells. Tyagi, R.D. and Vembu, K. (eds). CRC Press, Boca Raton, pp. 45-79.
- Yang, P.Y., Cai, T. and Wang, M.L. (1988). Immobilized mixed microbial cells for wastewater treatment. *Biol. Wastes*, **23**: 295-312.
- Young, A.H. (1984). Fractionation of starch. In: Starch, chemistry and technology, 2nd edn. Whistler, R.L., Bemiller, J.N. and Paschall, E.F. (eds.) Academic Press Inc., pp 249-274.
- Yurkov, V.V., Gorlenko, V.M., Mityushina, L.L. and Starynin, D.A. (1992). Effect of limiting factors on the structure of phototrophic associations in thermal springs. *Mikrobiologiya*, **60**: 129-138.
- Zürrer, H. (1982). Hydrogen production by photosynthetic bacteria. In: New trends in research and utilization of solar energy through biological systems. Mislin, H. and Bachofen, R. (eds), Birkhauser Verlag, Basel, pp. 70-72.
- Zürrer, H. and Bachofen, R. (1979). Hydrogen production by the photosynthetic bacterium *Rhodospirillum rubrum*. *Appl. Environ. Microbiol.*, **37**: 789-793.