International Journal of Pollution and Noise Control
Vol. 1: Issue 1
www.journalspub.com

Studies on Treatment of Textile Waste Water by using SBR

Gobinath R.*, Sathes Kumar K., Gokul D., Hari Prasad G., Sivakumar V., Manoj Bharathi K.
Department of Civil Engineering, Jay Shriram Group of Institutions, Tirupur (Tamil Nadu), India

Abstract
The current study explored the adeptness of SBR technology in treating wastewater from textile industry which is considered as a high toxic wastewater. Many studies are going on throughout the world in studying the effectiveness of SBR with different media. In this study we are using geonet and plastic cap as a combined media for the attached growth of the bacteria. The SBR reduced the COD from the textile wastewater by 55%. In this study, the capabilities of SBR technology in treating relatively higher concentration of inorganic impurities present in the textile wastewater are studied and discussed.

Keywords: *Aerobic process, textile wastewater, SBR*

****Author for Correspondence:** Email ID: gobinathdpi@gmail.com*

INTRODUCTION

The textile industry contains an extensive chain of complex activities, from processing raw materials up to finishing the fabrics.

These industries have created job opportunities to millions of people and have become one of the major sources of incomes to many countries in the world. Unfortunately, the industry is also one of the major contributors to water pollution.

The textile wastewater contains not only the colorant, which is one of the main pollutants, but also other chemicals that are added throughout the textile processing.

The dye compounds present in textile wastewater are able to impose a major impact to a receiving water body even in small quantities. Since 1990, using aerobic sludge in SBR, biological treatment has been run-through for well.

SBR technology is very effective biological treatment and it is capable to eliminate nutrient and organic compounds and also in treating wastewater in one single reactor[1]. The maximum efficiency treatment obtained in textile wastewater was being achieved.

The authors carried out the experiments in a bench-scale reactor, fed with wastewater from the University of Olsztyn treatment plant and concentrations of the examined activated sludge varied between 2.5 and 6.0 kg m^{-3} SS. Laboratory analyses of the sludge included: sludge concentration, settle ability, sedimentation velocity and sludge volume index (SVI) and the result revealed very good settling properties of the sludge.

With low SVI (30–60 ml g^{-1} SS) there is an intensive and fast sedimentation which shortened the settle phase to less than one hour. Moreover, low SVI prevented the sludge from bulking.

High dissolved oxygen concentrations in the aeration tank during the react phase resulted in little sludge biomass growth, which is very important from the viewpoint of sludge disposal at a wastewater treatment plant. The study of Janczukowicz *et al.*, was to investigate the Sequencing Batch Reactors (SBRs) efficiency for treating the wastewater[2].

Turbidity and overall solids elimination efficiency of the system, four sequential SBRs in laboratory scale were examined, considering the factors such as nutrient concentration, detention time, influent chemical oxygen demand (COD), and their effects on COD.

The results of the system with 10 h detention time, 1000–2500 mg/L COD and 100:5.1:1 C/N/P had the best efficiency with 92, 84, 52 percent removal for COD, turbidity and total solids, respectively. Pilot scale plant studies using SBRs were also done in the company[3].

MATERIALS AND METHODS

Experimental Setup

A sequencing batch reactor was constructed in the laboratory from glass material having a total volume of 93 L capacity. The reactor had a size of 70 × 45 cm.

The outlet of the reactor used for wastewater withdrawal was present at 26 cm from bottom of the reactor. This outlet arrangement prevents loss of biomass in the reactor after the settling phase is over.

The reactor was constructed with proper inlet and outlet arrangements[4-6]. The reactor was operated in attached growth configuration in sequencing batch mode at a room temperature of 24–27°C. The system is operated with the help of both pumping and gravity method.

The waste water is pumped in through the feed pump and the air supply is provided by means of diffused aerators connected to aeration motors[5-7]. During the reaction phase and aqueous phase dissolved oxygen was maintained in the range of 4.0–5 mg/l. The samples after aeration are removed from the top level by means of Gravity method and are collected for the testing and or for further process from there.

The mixed liquor from the aerobic chamber of the ASP unit was acquired and was fed to the SBR reactor.

After inoculation, the reactor was operated with feed (glucose, sodium, calcium etc.) to build up the biomass[6-9].

Testing Method

1. pH: Glass Electrode Method; **(**Jackson 1967)
2. Conductivity: Conductivity Meter; (Jackson 1967)
3. Total Dissolved Solids (TDS): Filtration, Evaporation (1030c) Method: (S.M.APHA, 1992)
4. Iron: Colorimetric/Spectrophotometric Procedure
5. NH4: Colorimetric/Spectrophotometric Procedure (APHA, AWWA, WEF, 1998)
6. Sulphate: Turbid metric Procedure (APHA, AWWA, WEF, 1998)
7. Chromium: Colorimetric Procedure (APHA, AWWA, WEF, 1998)
8. Biological oxygen demand (BOD): Titrimetric Procedure (APHA, AWWA, WEF, 1998)
9. COD: Open Reflux Method: (S.M. APHA, 1992)

RESULT AND DISCUSSION

The initial pH of the waste water was found to be 7.9 and the pH is found to be reduced when the aeration duration increased. At the end of 120 h, the pH reduced to 7, this is the optimum pH level of the water. Conductivity was initially found to 28 units and it reduced to about 20 units. So, after the 120 h of aeration, conductivity was reduced to about 28%.

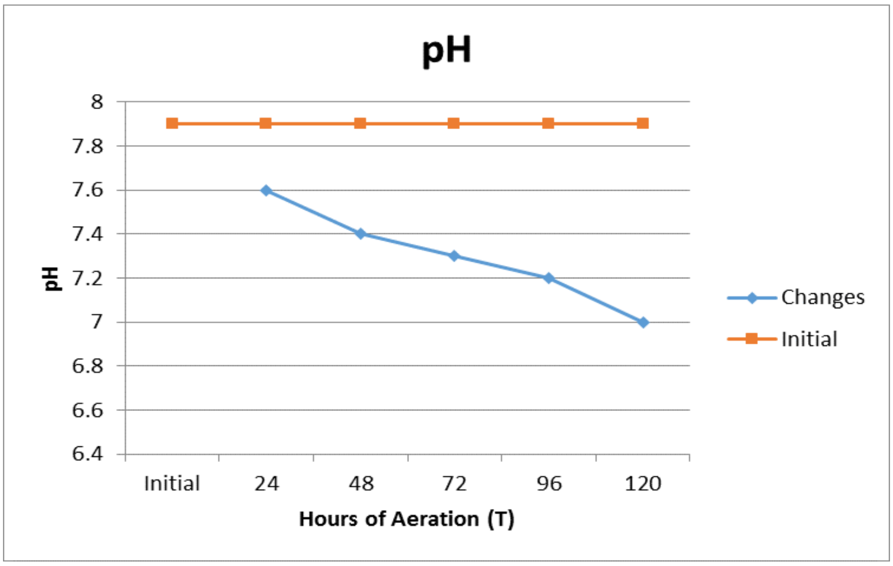

Fig. 1: *Variation of pH during Aeration.*

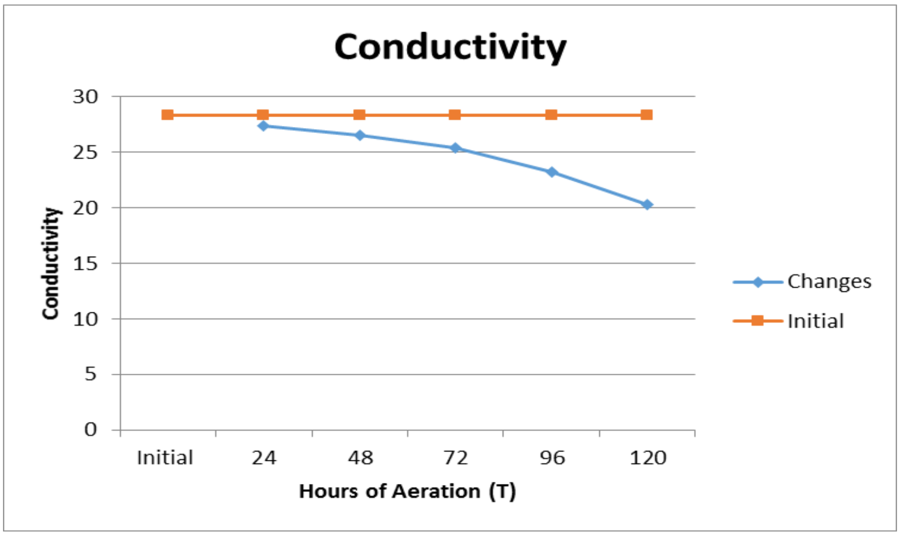

Fig. 2: *Variation of Conductivity during Aeration.*

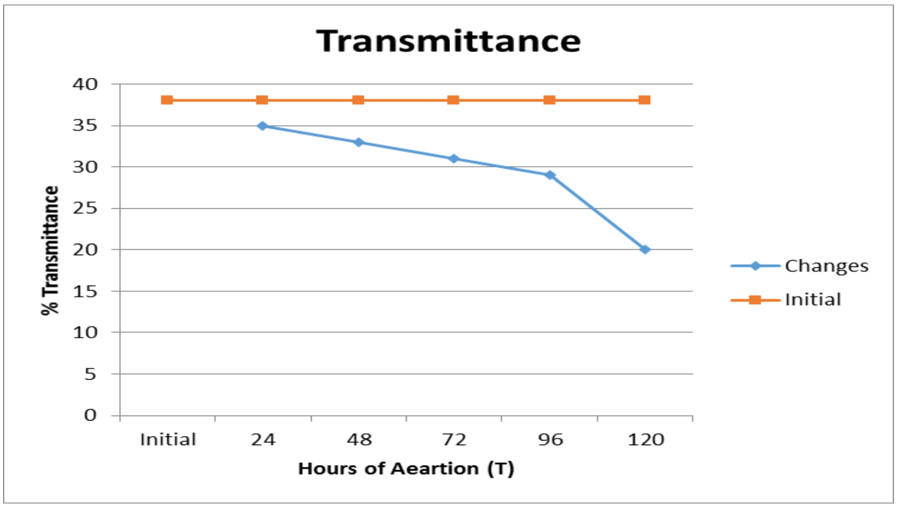

Fig. 3: *Variation of Transmittance during Aeration.*

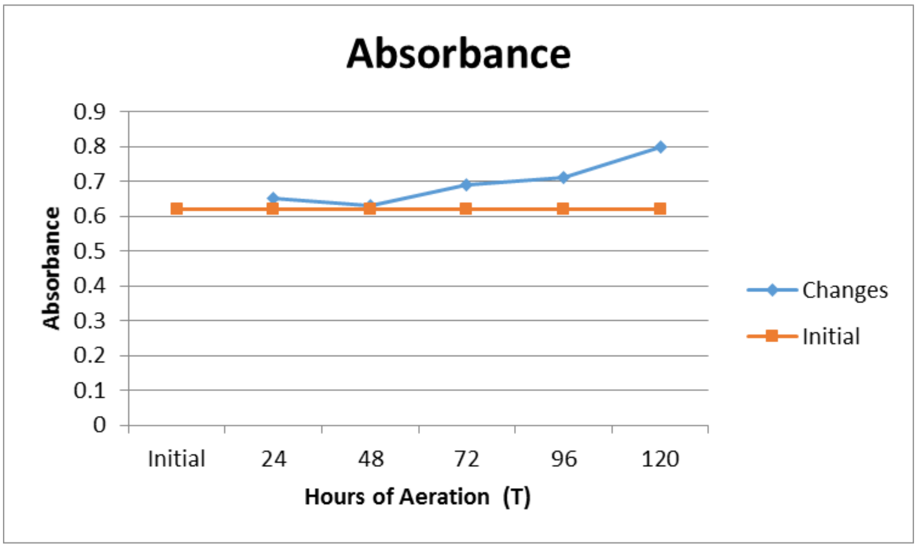

Fig. 4: *Variation of Absorbance during Aeration.*

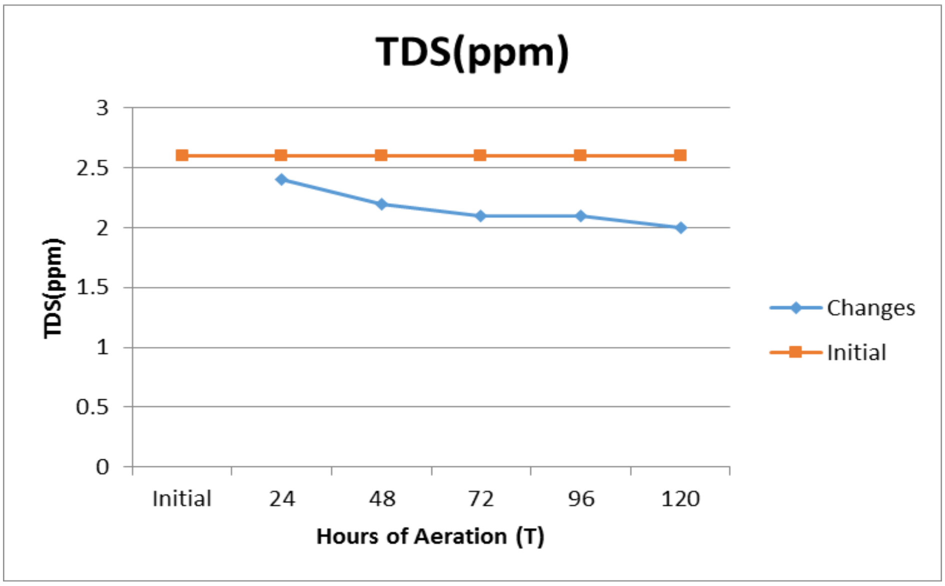

Fig. 5: *Variation of TDS during Aeration.*

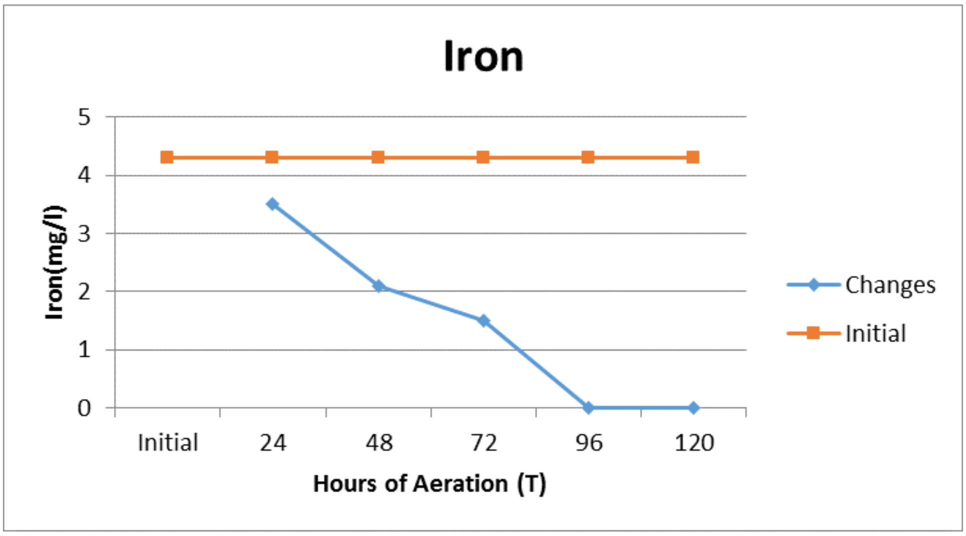

Fig. 6: *Variation Iron during Aeration.*

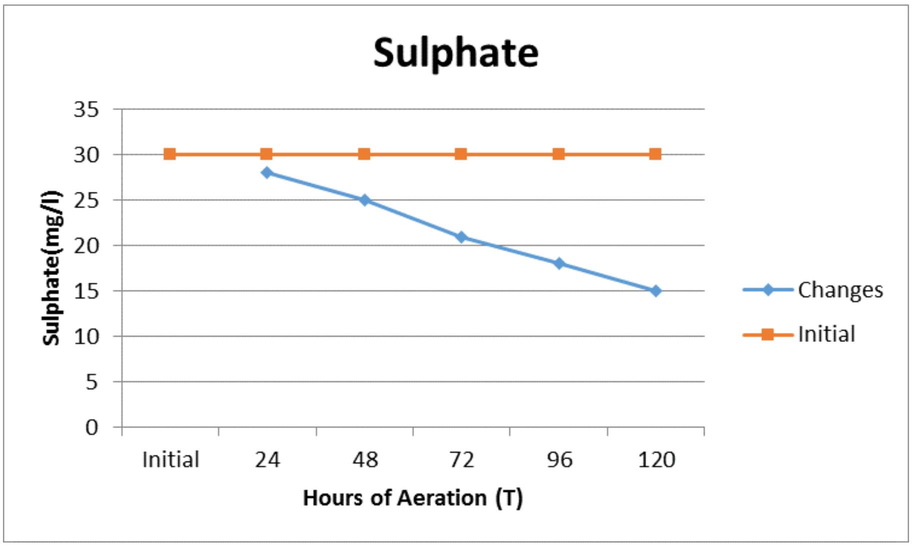

Fig. 7: *Variation of Sulphate during Aeration.*

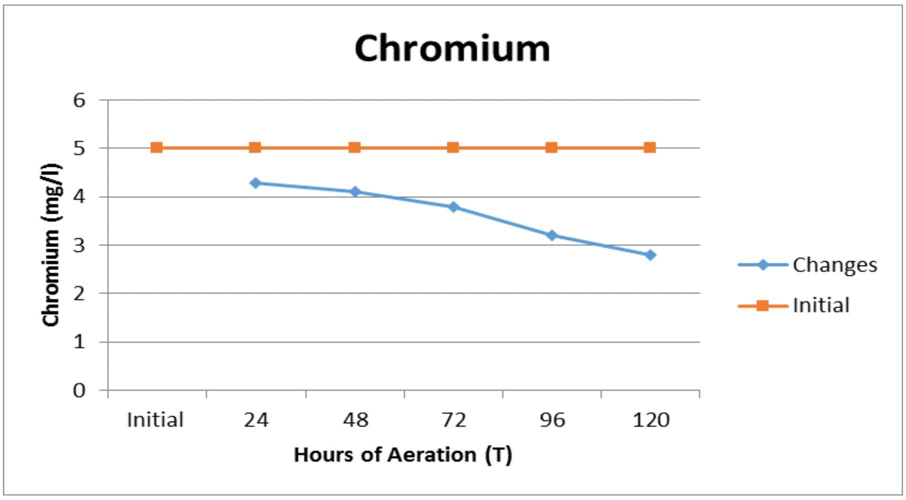

Fig. 8: *Variation of Chromium during Aeration.*

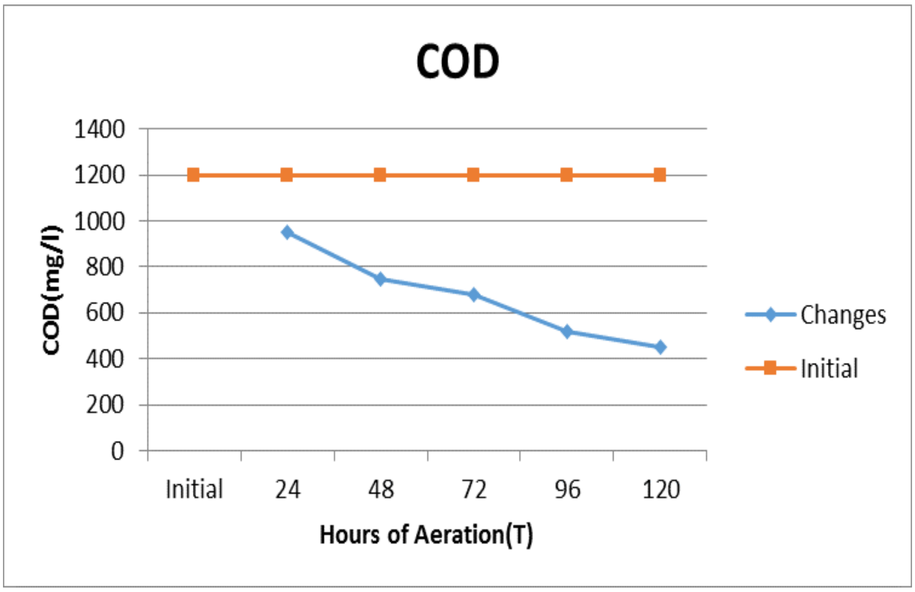

Fig. 9: *Variation of COD during Aeration.*

The initial waste water transmittance was found to be 38% and the transmittance was reduced to 20% after 120 h of aeration. Absorbance was initially found to be 0.62 and the final absorbance was 0.8 at the end of 120 h. TDS of the initial sample was found to be 2.6 ppm and at the end of 120 h the TDS was reduced to 2 ppm this is 23% lesser than that of the initial wastewater sample.

In the initial waste water sample the iron was found about 4.2 mg/l and after the aeration at the end of 92 h the iron was completely removed. Sulphate was reduced from 30 to 15 mg/l at the end of 120 h. This is 50% of the initial sample. Chromium was also reduced to 2.8 mg/l from the initial sample of 5 mg/l.

COD was reduced to 420 mg/l at the end of 120 h of aeration from 1200 mg/l at the beginning. This is found that 65% of COD was reduced. BOD was found to be reduced from 840 to 380 mg/l at the end of 120 h. This is 65% reduction of BOD to the initial sample.

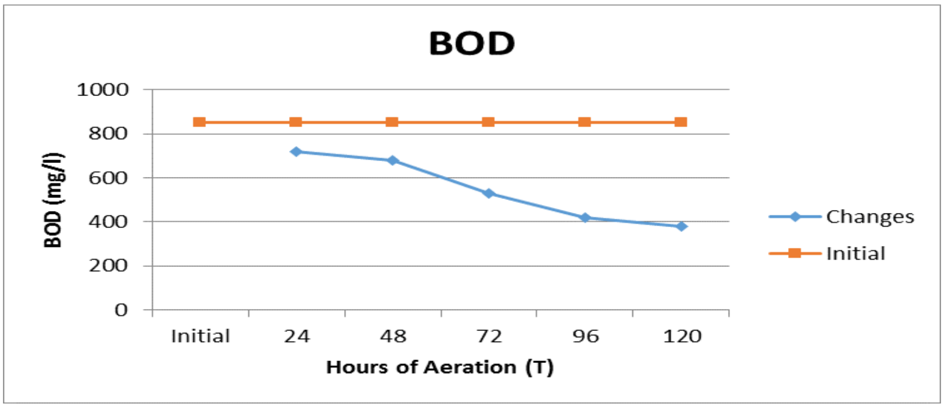

Fig. 10: *Variation of BOD during Aeration.*

Fig. 11: *Aeration Chamber.*

CONCLUSION

It is found that using the geonet and plastic caps as a combined media was found to be more effective, it reduced the BOD and COD levels for about 65%; this is found to be more efficient as the iron was completely removed, sulphate was reduced to about 50% and the chromium was removed to about 45%. Hence this combination of Geonet and plastic caps can be used as a media for the attached growth of the aerobic bacteria.

REFERENCE

1. Cirik K., Kitis M., Cinar O. The Effect of Biological Sulfate Reduction on Anaerobic Color Removal in Anaerobic-Aerobic Sequencing Batch Reactors. *Bioprocess Biosyst. Eng.* 2013; 36: 579–89p.
2. Janczukowicz W., Szewczyk M., Krzemieniewski M., *et al.* Settling Properties of Activated Sludge from a Sequencing Batch Reactor (SBR) *Pol. J. Environ. Stud.* 2001; 10(1): 15–20p.
3. Ganjidoust H., Ayati B. Use of Sequencing Batch Reactors (SBRs) in Treatment of Wood Fiber Wastewater. *Iranian J. Environ. Health Sci. Eng.* 2004; 1(2): 91–6p.
4. Abdullah N., Ujang Z., Yahya A. Aerobic Granular Sludge Formation for High Strength Agro-Based Wastewater Treatment. *Bioresour. Technol.* 2011; 102: 6778–81p.
5. APHA. *Standard Methods for the Examination of Water and Wastewater.* American Public Health Association, Washington, DC. 2005.
6. Fernandes H., Jungles M.K., Hoffmann H., *et al.* Full-Scale Sequencing Batch *Reactor (SBR) for Domestic Wastewater: Performance and Diversit*y of Microbial Communities. *Bioresour. Technol.* 2013; 132: 262–8p.
7. Filali A., Manas A., Mercade M., *et al.* Stability and Performance of Two GSBR Operated in Alternating Anoxic/Aerobic or Anaerobic/Aerobic Conditions for Nutrient Removal. *Biochem. Eng. J.* 2012; 67: 10–9p.
8. Hu J., Zhou L., Zhou Q., *et al.* Biodegradation of Paracetamol by Aerobic Granules in a Sequencing Batch Reactor (SBR). *Adv. Mater. Res.* 2012; 441: 531–5p.
9. Muda K., Aris A., Salim M.R., *et al.* Development of Granular Sludge for Textile Wastewater Treatment. *Water Res.* 2010; 44: 4341–50p.