

Mohammad Ali Semsarzadeh

In 1970 I continued my education in Ph.D at University of Pennsylvania under professor Charles C. Price, a well known polymer chemist with major contributions in polymer chemistry in the United States. My field of study continued from medical to chemical synthesis and kinetics from the undergraduate to the graduate level in the United States. **I graduated in 1975 at age 25**, member of Chemical Honorary Society, Phi Upsilon, I graduated as an excellent student in this field from University of Pennsylvania in 1975. From my course work and Ph.D. two ISI Publications and two Conference papers that were of interest to General Tiers and General Electric Co. where I had received grants and could continue to Post Doctoral research in Catalysis in Duke University. I accepted the invitation to return to Iran to start the polymer field in the Petrochemical Educational Universities in Iran in May 1975. I signed an agreement with Tehran Polytechnic, Department of Textile and Coloring to start this program. **In 1975, at age 25, I was the youngest faculty member with a formal dissertation and course work in polymer science and engineering who has started to teach graduate course in this field in Iran and start the polymer program in Iran.**

Number of courses I taught in graduate and undergraduate are in textile and polymer chemistry, polymer synthesis and technology or about 21 course units till 1981. The need for the new field in polymers continued with petrochemical industries, this need was even more urgent after the Iranian Revolution. These courses and program turn in 22 graduate students in this area for the needed education in this area and petrochemical industry in Iran. In April 1977, I was asked to visit Vienna, and put together a **graduate program** in this field by studying educational program from the polytechnic in Vienna: Laboratorium Fur Kunststofftechnik (LKT-TGM). I was also assigned to visit number of polymer industries in Austria, and outline the program for the start of a project in Polymer Technology Center in Iran. The Lecture in UNIDO in plant session in 1981: **Foundation of Polymer Technology Center in Iran**. And further publications in Austrian Plastics Journal and United States Plastics Engineering states our progress in this area. Within few years we were able to start this program based on the agreement that was signed and put this program into action by the University and the Ministry of Higher Education. Acting as a principle member in this project, I was able to add 12 training grants from the Austrian industries, BPR, EN and CM, for the faculty employed in this program twelve training programs each 1 to 4.5 months for our new graduate students went into effect to complete the training course of this program in LKT_TGM and the Center till 1981. In addition to teaching, the responsibility of this Center was also assigned to me in 1980. **The first International Symposium of Polymer Science and Technology of Iran**, ISPST with cooperation of Austrian industries, LKT-TGM and UNIDO was held in Tehran late in 1976. In a letter, I reminded the head of University to act on a year agreement with Ministry's Project on the Center ordering the equipment and set up a seminar before we lose the project. I also asked a closer ties with polymer industry and suggested second phase of the program or 100,000 \$ Project in Iran, as reported in ISPST Seminar published in 1978. This seminar documented the results of this project, and enabled us to continue the polymer education in Iran from 1975. Immediately after the Iranian Revolution with my hard effort as the only member interested to establish this field in Iran, I took over the new responsibilities in the University Council, Head the polymer group for few

essentially important months and completed the project by employment. The new administration was brought to approve of the polymer group based on the interest of the industry or NIOC Research Center, Iran-Hochst, ISIRI, Polydactyl CO., PVC, Aliaf CO were the original supported of this field in Iran. In 1979. Textile Department, signed by 18 faculty members made the new Polymer Group in Tehran Polytechnic official. Then as a member of the administration board, **I employed 9 full and part time faculty members** with B.S, M.S. and Ph.D degrees from France, Canada and Austria, Britain and Iran. Next, I took the responsibility for the new Committee in Ministry for industrial tests and special laboratories and work shops in this field for the polymers manufacture in Iran. I left to Vienna, to bring new staff needed for machinery and training, **within a year I put the new equipments into operation alone**, under the hardest conditions during the Iranian war **I invited the faculty and the members of Committee to visit our workshop**. With the equipment and projects our new educational program in Polymers in Polytechnic went into approval to Ministry with new Suggestions.

In 1989, with the new staff from Austria, we were able to help the plastics production and industry during the war. Within few years at least four of our graduate students started new plants in resins and rubbers and we assisted them without any charge to run their operation or to standardize them. This action was taken at the time when the imported unsafe plastics were in widespread use and could make strong effect. Our educational program and efforts has now paid back the country by helping them to make the plastics safe in Iran. The same specialty helped other polymer industries in Iran in PVC, PU and Polyesters. In 1977 **The United Nation notified the success in this program in its CHEM/R.32/Add.1 news as the first novel arrangement worked between LKT and Polytechnic's Polymer Technology Center in Iran**. This encouraged us to invite UNIDO to singe the second and the advanced second phase of the project with us, that we fell short of budget in 1979 when the war broke. For this phase I enacted my project on aromatic polymers. The second seminar was held in 1980 in cooperation with Tehran University and Alzahra University. I worked on the third seminar to help the plastics industry to support the second phase Demag Co. in Tehran was encourage to start on the new and advanced work, I translated all the advanced materials free of charge and directed the seminar for this support in 1980.

In 1981, with the change in the administration of the university, the research and teaching activities were halted for months. I forwarded my research results to Austria and Britain to attend the conference. Approved by the Ministry of Higher Education, I attended the 12th UNIDO IN Plant Program in Plastics Technology in Vienna in LKT from Sept, to Oct. 1981. I reported on the Foundation of activity of the Polymer Center in Iran, that was well received and appeared further in the Austrian Plastics Journal. I received the same from the United States, when my research work was well received by the Plastics Engineering Conference. **The Plastics Engineering Society published these results in Oct. 1984**. My ISI publication from the research in Iran strengthened the polymer group in the engineering and Tehran Polytechnic went confident to continue the Polymer Center Project. My contribution in the area of cellulose-polyester with total of 5 articles and 5 conference papers were also of interest to the industry and research labrotories and Universities were also interested in this area. In 1984-85, with the invitation of the new head of Tehran Polytechnic, I returned and continued to teach polymer in the graduate levels. I worked with Beton

Chemie, to completed and standardize their work. With my return I brought back new area of automations, I presented the results in the seminar in Chemical and Petrochemicals Committee in Polytechnic in 1985. **In 1986 I was assigned to run the PhD program in this area, and acted as member of the graduate committee in MS and PhD committees of the Department, were the new courses are to be approved.**

In 1997 my research work in the United States came up with 210,000 \$ grant, and I became famous in polymer industry in the United States. The official disclaim of 18 cases related to the electrically active materials, was published that indicated my second success in the area of polymers in the United States, and my third attempt to start on the new fields of automation and polymers In this highly competitive and new field I tried for three years to earn the new skills in fast changing field. In 1991 I tried hard to force the polytechnic to cooperate in this area but in 1992, I had to accept a new agreement with Tarbiat Modares University.

In 1992 , I started my full research and teaching activities in Tarbiat Modares University. I immediately joined Jihad team to help them with their Polyurethane Projects and solid fuels project , I turned in a trained Ph.D student to help them with this project and polymers. Next I joined the Petrochemical Industry and Polymer Manufacturing Plant in Arak, to assist them with the Ziegler Natta Catalysts and Polyethylene. At this time the country is in the new era of expansion in manufacturing of polymers and petrochemical industry. This field in PE appeared completely new because of catalysts, kinetics, and thermodynamics. Soon Polymer manufacturing plants in Iran were rapidly growing from to 23 petrochemical polymer plants with 9 tire manufacturing and three large auto industries, which made the new demand for education at its peak. This persuaded me to suggest a new polymer group in this university and use chemical engineering student in polymers. With assistance of number of my colleagues in this university, documented by official letters **I started to work on the formation of the new group and its educational program by Ministry of Higher Education in this University .** Our graduate students increased from 5 to 15 and to 21 in 2003. **As the head of this group for eight years, I took certain actions to equip the group, 135,000\$ equipment was approved and put in use . Courses were assigned and organized with new and valid text books.** As a member of the Ph,D Committee, with the assistance of the projects completed in Jihad, on polyurethanes and Arak and Bandar Emam Petrochemicals on Ziegler Natta Catalysts, and **Conferences held in the industry, University Council approved of the Ph.D. Program for Polymer Industries Group in 1998.** The plant visits made the students and faculty familiar with petrochemicals, tire, plastics industries and Tarbiat Modares university. This university was equipped with NMR, XRD, SEM and DSC that made the Research director of BEPC and APC to run 5 petrochemical projects with the University. As a member of National Projects, my **projects on polyvinyl acetate** and alcohol was approved in 1998 the project that transferred many technical skills to the university. Now we had not only made the first Polyethylene in Iran in BEPC we had made the petrochemical industry bold enough to make its own catalysts in this area. We had also a great experience in Polyvinyl Acetate that must lead us to discover a new polymerization system: ATRP. In other area of toughened plastics Nylon, Polyurethanes the **research and applied work in this area brought the university some name and recognition from the Industry and Petrochemical**

Plants, Oil Gas and Petrochemical Conferences and the Third International Rubber Conference in Tehran in 1996.

The need for the second educational program in polymers is in polymerization, this program started in 2008 in this University. Since the country's need in this area must last as long as oil and gas resources last the education in this area considered is considered the only and most important long term investment that university can take to serve the country. **43 new petrochemical plants and 8000 of plastics and resin workshops double every ten years and the need grows in the area of** polyethylene, polystyrene and PVC, poly vinylacetate and urethanes, polyester and polyamides.

The new group in Polymerization Processes, was approved as the Macromolecular Science and Engineering as offered in the United States, by this department in 2006. The group educational program was approved under the Polymerization Process program of the Ministry of Higher Education in 2008. It is currently operating with 3 laboratories, 3 full time and 1 part time staff and 17 graduate students. This group rests on the projects supported by the industry or 5 approved petrochemical projects and 6 other related projects in polyethylene. With the total of 21 projects in this area supported by the Ministry, Petrochemical industries, Ministry of Industry, or Centers.

Areas of Research In Polymerization:

The research in liquid crystals, and high strength polymers similar to steel, with polyamides needed for the auto and space or tire industries supported by NIOC Research Center or University. This area was started in 2010, for advanced polymer industries in Iran in synthesis of PPT.

In the area of Emulsions, and micro emulsions. This area was originated from the National Projects in Polyvinylacetate and alcohol in isolation of fatty acids, and acrylates used in Cements, and a new inversion system invented for epoxies for high compression Cements.

In the area of Catalysis, new mesoporous silica particles based on Block Copolymers, SPB were introduced in making new catalysts to make crystalline polyvinyl acetate with $TiCl_4$ catalyst. Cobalt acetoacetate with ligand originated a new polymerization reactions with vinyl acetates, silicones and aromatics holding our position in the new area of block copolymers and controlled radical polymerizations.

In the areas of Membranes. We are the first to introduce the microphase systems made up of polyurethanes and polyvinyl acetate for a higher transports of gas. This area is new for petrochemical industries.

On Block Copolymers, in 2000 new polymerization reaction was discovered by Matyjaswski in the controlled radical polymerization reaction by ATRP, In 1979. we were able to increase the yield and reduce the molecular weight distribution of vinylacetate radical polymerization from a broad molecular weight to 2.2. To day our results is related to the stabilized controlled radical polymerization SFRP. **I had**

used amine to mediate and control the radical reaction in the stabilized radical polymerization in 1997. This research has been continued with **polyvinylacetate macroradicals.** Since we have synthesized more than 92 block copolymers based on vinyl acetate, using SFRP, ATRP and CRP reactions. In 2003 we received a prize for our new Block Copolymers

Block Copolymers have been commercialized by industry, therefore, the continued research and developments in this area is important for the current and future polymer industry. Many industries in US, Europe and Japan use these polymers in many chemical industries, gas, oil, agricultures and membranes: See *Macromolecules* 2012..

With 36 years of experience in this area, as a senior member of the editorial board of *Journal of Polymer Science and Technology of Iran* since 1974, and its IPJ for 15 years. I have acted as one of the principle Founder of this field in Iran, named by Iran Polymer Science Society in 2001, I have helped this field in Iran from its very beginning in education, technical works, seminars and conferences, in Universities and Centers. Specialized in polymer synthesis, kinetics, catalysts, and physical chemistry of polymers I have continue to contribute in this area molecular modeling and quantum, and processing. Members of number of Iranian and International Societies, with 44 prizes and letters of appreciations from University, Centers and Industry I have completed 21 research projects, with 248 publications. I have graduated 60 students and 13 PhDs students in this field.

Mohammad A. Semsarzadeh:

Member of Phi- Upsilon Honorary Chemical Society in United States

Numbers of Publications: 248

Numbers of Educational Groups Contributed to the Start of this Field in Iran: 3

Number of Research Center Projects Completed: 1

Number of Prized and Letters of Acknowledgments and Appreciations:44

Number of Official Prize: 23

Number of Technical Certificates in This Field:2

Number of Students Graduated: 60

Number of Ph.D. Students Graduated:10

Member of number of Societies in Iran:3

Member of Societies outside of Iran in different times: 3

Senior, Founding Member of Iranian Society of Polymer Science.

Senior Member of Iranian Journal of Polymer Science and Technology since 1976

Number Course Units Taught in Polymers, Undergraduate ,Graduate Levels:78

Numbered of Seminars Started, or Directed in this Field: 1 International, 1 Scientific, 2 for the Society, 1 for the Department.

Number of Pilots designs in the Processing and Manufacturing: 4

Number of Industrial Sessions held: 2

Number of Advanced Lecture Notes: (25-50 pages): 17

Number of Lecture Notes: 135

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Number of Articles with Recorded Abstract with ISI: 110

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