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EXPECTED AND UNEXPECTED ACHIEVEMENTS AND TRENDS IN RADIATION PROCESSING OF POLYMERS

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The last four decades produced exponential development in the polymer processing. Radiation processing yielded a similar pathway of development in the beginning, mostly in the radiation crosslinking of polymers and in the radiation sterilization of polymer products. Some expectations on several related fields such as radiation grafting, surface coating of polymer films, etc., have not really been fulfilled. There are some unexpected results in the developments of the radiation chemistry of polymers utilized well in the polymer processing today. The most dynamical developments of the *microelectronics* in our days is based on the efficient utilization of radiation-crosslinkable *negative photoresist* polymers and the radiation degradable *positive photoresist* polymers.

Rapid prototyping and rapid tooling are indispensable methods in the continuously renewing manufacturing technologies of metal and plastic parts for almost all the industrial branches. Rapid prototyping allows to make a real polymeric part of an automobile or of a mobile phone directly from the computer assisted design draft on the monitor, without any human interference. The selective laser lithography is using radiation-reactive oligomers for this purpose.

Polymer composite manufacturing is also profited in many ways from the experiences of radiation technology. High-tech composites of advanced fibers such as graphite, Kevlar, HOPE and other ones require well-engineered interface between reinforcing fiber and matrix. This interface is the key factor, especially in the case of injection-moldable composites of short fibers and thermoplastics, and this interface can greatly be improved through ionizing radiation. Our recent results in this field confirmed substantial benefits in the case of carbon fiber reinforced structures and in the case of natural fiber reinforced composites as well.

Compatibilization through radiation-reactive monomers and oligomers is attacking two great fields of the future polymer processing. *Recycling* of commingled polymer wastes, and manufacturing new type of *alloys* of different synthetic as well as natural polymers are requiring well engineered interface which can be achieved by radiation processing in a technically feasible and economically viable way.