Technology Topics Overview

Most of the topics summarized in this document are polymer related.[1] Polymers are large molecules built up of many (*poly*) individual, smaller units (*mer*s). Polymers derive their physical properties (*e.g.* elasticity, flexibility, strength) primarily from their size. Differences in *chemical makeup* (*e.g.* chemical or chain microstructure), *architecture* (*e.g.* linear, branched, crosslinked), and *morphology* (*e.g.* amorphous, semicrystalline) result in unique properties for a specific polymer and in many cases these properties can be tailored by adjusting one or all of these parameters. The indispensability of polymers is apparent from everyday life. Plastics, rubbers, foams, cements/adhesives, paints/coatings, fibers are all polymer products. Examples of common items containing polymers include:

1. Rigid Thermoplastics
    a.
        i. Appliance housings (*e.g.* computers, coffee makers).
        ii. Toys and sporting goods (*e.g.* action figures, football pads).
        iii. Automotive (*e.g.* interior components, truck bed liners, bumpers).
        iv. Health care (*e.g.* pill capsules, surgical tools, cosmetics, toiletries).
        v. Data storage (*e.g.* compact discs, magnetic tapes).
        vi. Food storage (*e.g.* 2L bottles, microwavable food containers).
        vii. Electrical insulation (*e.g.* wire insulation).
    b. Films
        i. Bags (*e.g.* trash, grocery/shopping, food storage).
        ii. Packaging films (*e.g.* food wrap, shipping stretch wrap for pallets).
        iii. Tapes and labels (*e.g.* duct tape, clothing labels).
        iv. Agricultural (*e.g.* greenhouse coverings, garden overlay).
    c. Fibers
        i. Ropes (*e.g.* ship mooring, climbing, utility).
        ii. Clothing/bedding (*e.g.* household, ballistic resistant, fire resistant).
        iii. Carpeting (*e.g.* indoor, outdoor).
        iv. Reinforcement for composites (*e.g.* specialty high strength).
        v. Geotextiles (*e.g.* weed control, erosion control).
    d. Transparent Glasses
        i. Windows (*e.g.* airplane canopies, structural).
        ii. Optics (*e.g.* eye glasses, contact lenses).
    e. Coatings
        i. Nonstick (*e.g.* coated cookware).
        ii. Polishes/waxes (*e.g.* car care products, floor polishes).
2. Rigid Thermosets
    a. Cements/adhesives
        i. Glues/cements (*e.g.* epoxy cements, particle board/plywood glue).
    b. Protective coatings
        i. Enamels/paints (*e.g.* automotive, marine, structural).
3. Flexible Thermosets (Elastomers/Rubbers)
    a. Protective gear (*e.g.* surgical gloves, fireman scba gear).
    b. Belts (*e.g.* automotive serpentine, conveyor).
    c. Tubing and hoses (*e.g.* fuel transfer, vacuum tubing).

d. Tires (*e.g.* automotive, airplane).
e. Toys and sporting Goods (*e.g.* dog toys, racquetballs, basketballs).
f. Binding (*e.g.* rubber bands, bungee tie downs).
g. Adhesives/sealants (*e.g.* caulks, hot melt).

4. Foams
    a. Insulation (*e.g.* weather stripping, spray-in insulation, soundproofing).
    b. Support (*e.g.* furniture cushions, protective packaging, carpet underlay).
    c. Food containers (*e.g.* coffee cups, fast food containers).
    d. Floatation (*e.g.* marine, personal flotation devices).

References

1. Two good general references for polymer science are: (a) Odian, G. *Principles of Polymerization*; 3rd Ed.; John Wiley & Sons, Inc.: New York, 1991. (b) Billmeyer, F. W., Jr. *Textbook of Polymer Science*; 3rd Ed.; John Wiley & Sons, Inc.: New York, 1984.