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**Lectures for PhD students, Gdansk University of Technology 1<sup>st</sup> – 5<sup>th</sup> April 2019**

## **COMPATIBILIZATION OF POLYMER BLENDS:**

### **INTERFACE ANALYSIS OF BLENDS AND PROPERTIES MANIPULATION**

The performance of multicomponent polymer systems depends to a large degree on the situation of interface between phases of almost dissimilar nature. Typically, polymer blends show phase separation or a rather small miscibility window because of the polymer-polymer interface being not thick enough to make facile transfer of stress from one phase to the interface, and thereby to the other. This is mainly the consequence of long chains of two or more polymers that are not able to cling on their first time processing at a molecular level. In the other words, chain flexibility changes from one polymer to the other because of difference in chemistry due to dissimilar polarities, degree of polymerization, stiffness, and conformational or configurational states of polymers in a polymer blend. For compatibilized polymer blends, there might be possible to tailor two chains of different characters by the use of a coupling agent, known as 'compatibilizer'. However, some further difficulties may arise from the aforementioned dissimilarities as well as unfair localization of compatibilizer at the interface of polymers. It is customary to judge about interface situation indirectly by evaluating the ultimate properties of polymer blends when one compares them with those of the parent polymers the corresponding non-compatibilized system. In this sense, researchers and engineers took mechanical properties alike as the main signature of interface of compatibilized polymer blends, while analyses on interface are still few and spread. To tackle difficulties in understanding the effect of compatibilizer on polymer blend properties, focus should be placed on analysis of a micron-level zone, known as 'interface region'. Here we attempted to integration reports in the field into a chapter to give direction to the judgments. Starting from compatibilized binary blends, a brief overview is presented based on available reports to characterize the interface of polymer blends from both microstructure and properties standpoints. Then, ternary blends are studied, and recent outcomes obtained by the researchers are discussed. Since mechanical properties can appropriately reflect the effectiveness of compatibilization and are directly dependent on interfacial adhesion, we ignored effect of interface on thermal and rheological characteristics of

reactively blended polymer systems. Finally, the key questions to be answered are highlighted to pave the way for analysis of interface in multicomponent polymer blends.

**Keywords:** Polymer Blend; compatibilization; interfacial tension; interfacial adhesion

The following topics will be covered by the lecturer:

*1-Interface in polymer blends in the absence and presence of compatibilizer*

*2-Analysis of interface in the compatibilized binary polymer blends*

*2.1-Interfacial tension and interfacial adhesion concepts: Experiments and theories*

*2.2. Towards quantification of physical and chemical interactions*

*2.3. Structure-property relationship from interface perspective*

*3-Analysis of interface in the compatibilized ternary polymer blends*

*3.1-Morphology manipulation by interfacial tension regulation*

*3.2. Interfacial adhesion quantification*

*3.3. Effect of mixing sequence: Manipulation of compatibilizer localization*

*3.3. Optimization of properties of compatibilized ternary blends*

*4-Key questions to be answered for future developments*

Termin	Dzień tygodnia	Godzina	Miejsce
01.04.2019	Poniedziałek	9.15 – 12.00	Minicentrum Konferencyjne (Luwr)
02.04.2019	Wtorek	9.15 – 12.00	Minicentrum Konferencyjne (Luwr)
03.04.2019	Środa	9.15 – 12.00	Minicentrum Konferencyjne (Luwr)
04.04.2019	Czwartek	9.15 – 12.00	Minicentrum Konferencyjne (Luwr)
05.04.2019	Piątek	9.15 – 12.00	Minicentrum Konferencyjne (Luwr)