Mechanical Properties of the Fluoride-42 Polymer Composition with Aluminum Oxide Submicronal Particles

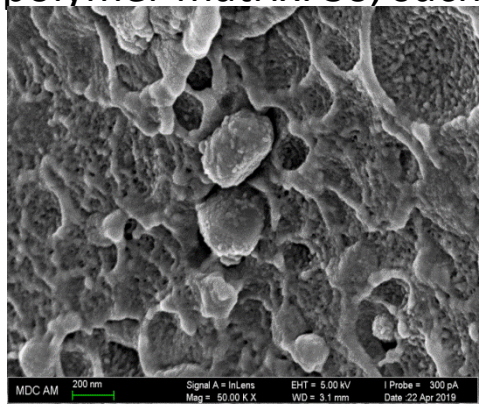
Maxim Danilaev, Michail Klabukov, Sergey Karandashov, Vladimir Kuklin , Igor Sidorov , Anna Enskaya

Speaker Name: Maxim Danilaev, Igor Sidorov
Position: Dr., professor
University: Kazan National Research Technical University named after A.N. Tupolev – KAI

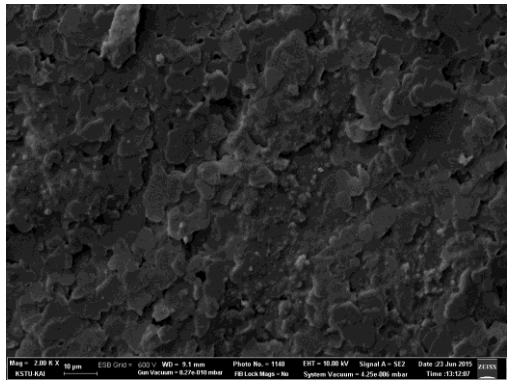
Poster Session

Problem:

The polymer composition mechanical characteristics with an amorphous and partially crystalline structure are different when the adhesion value between submicron particles and a polymer matrix is the same. It is because the reason of such polymer composition destruction is structural inhomogeneities and interfacial regions, including the interface between filler particles and polymer crystallites. The adhesion value between the filler particles to the polymer matrix is influence on the size of the interfacial region and it mechanical properties. The polymer composite mechanical characteristics with a partially crystalline structure and an amorphous structure have a different change on the adhesion value change between submicron particles and polymer matrix. So, such polymer composite mechanical properties should depend on the filler particles concentration.



Dispersed filler polymer with amorphous structure

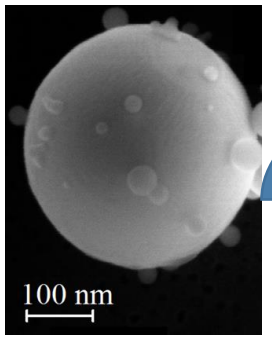


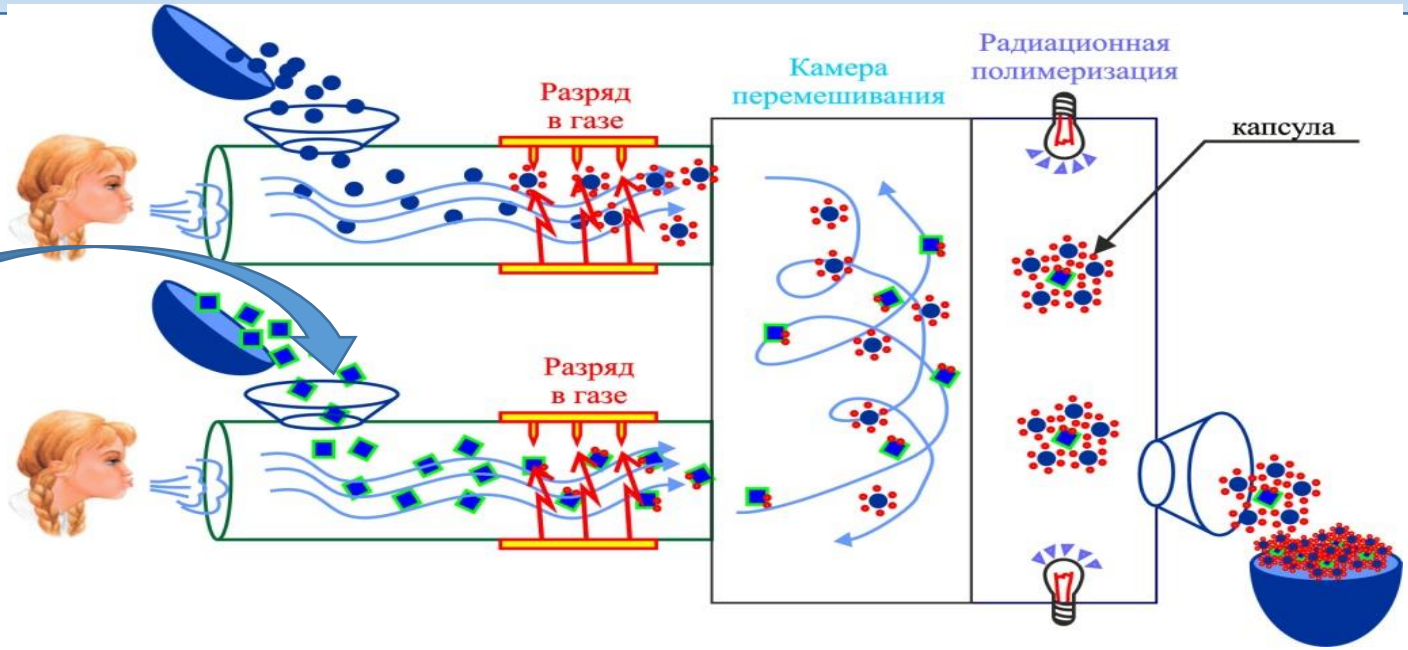
Dispersed filler polymer with partially crystalline structure

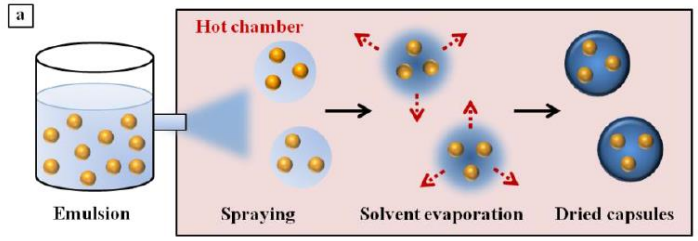
Purpose:

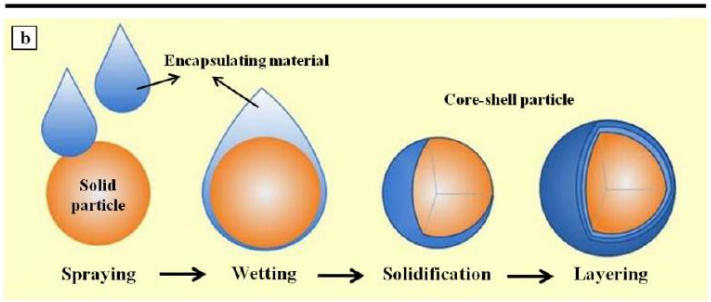
The determination of submicron filler particles concentration influence at the mechanical properties (tensile strength, elongation at break, Martens hardness) of fluoride - 42 composite.

Poster Session

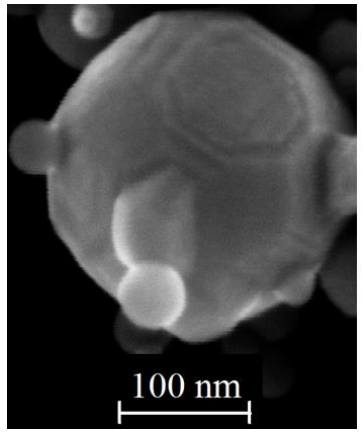








Sample preparation technique



Poster Session

Samples type	Filler particles mass concentration, %	Volume filler particles concentration, [1/μm³]
Sample 0	–	–
Sample 1.1 Sample 2.1	0.06	~10
Sample 1.2 Sample 2.2	0.6	~100
Sample 1.3 Sample 2.3	1.2	~200

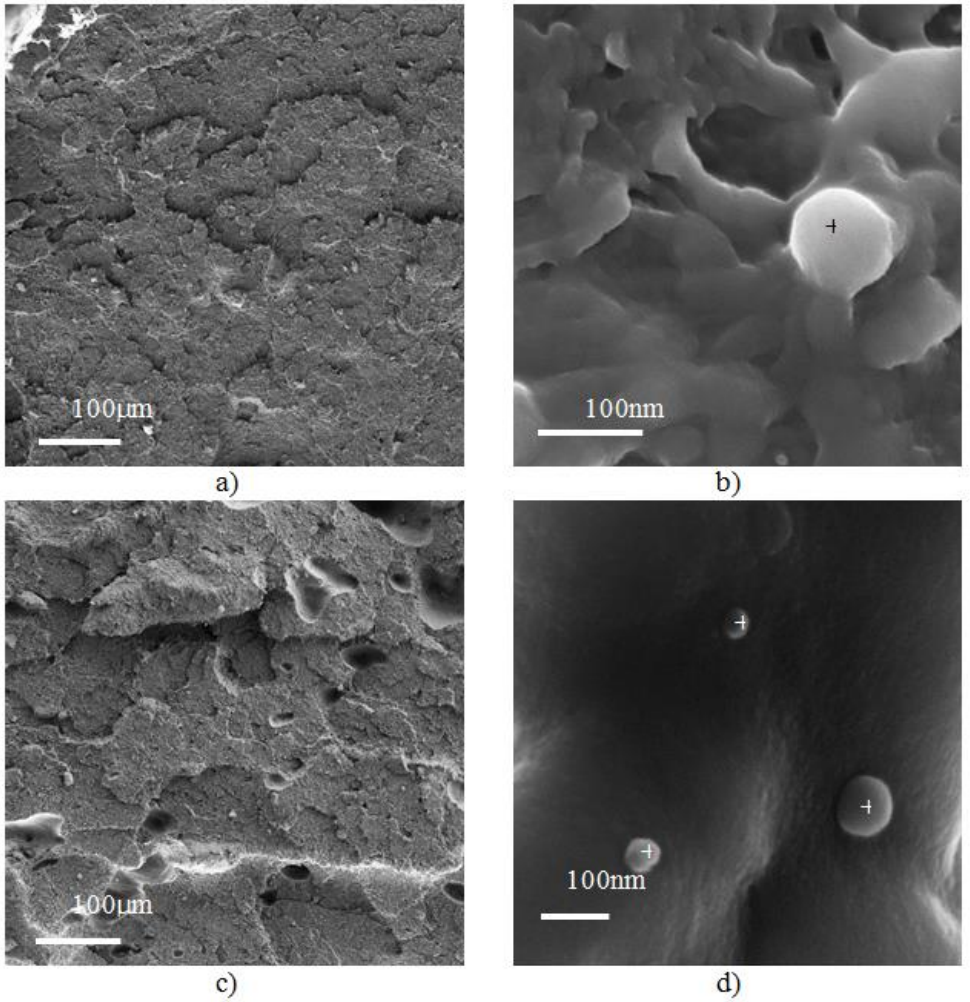
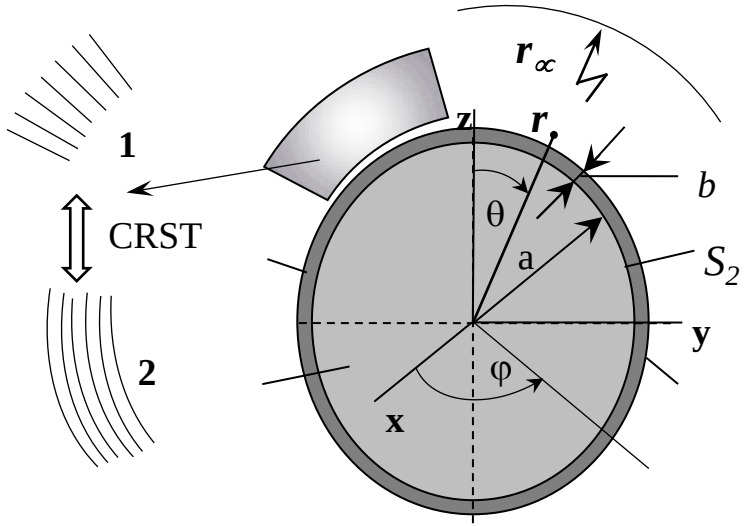
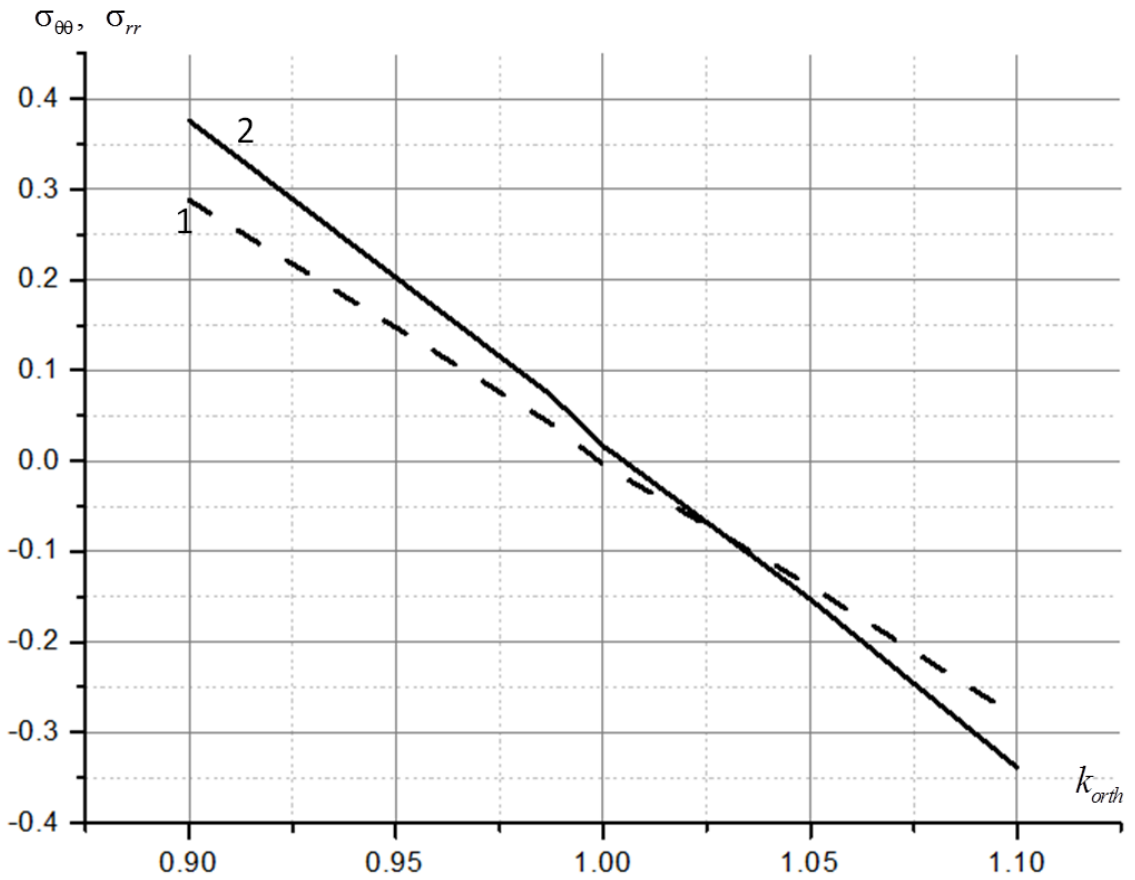


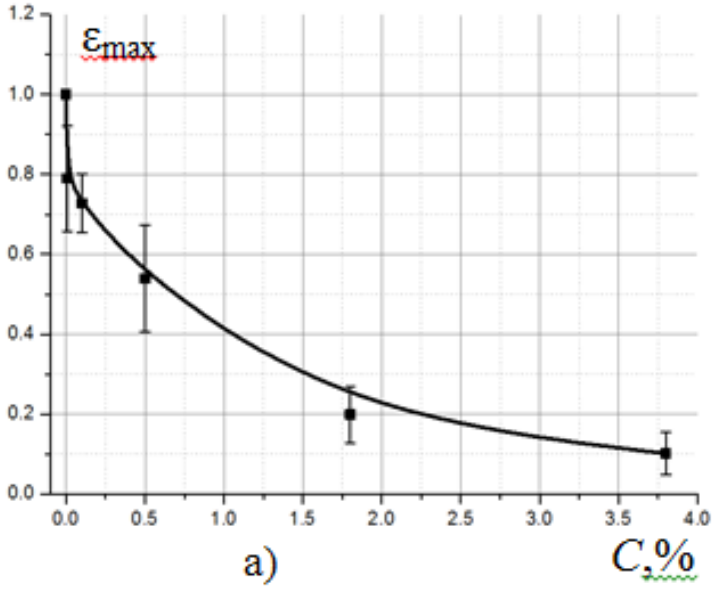
Fig.1. Micrographs of the samples: a,b – Sample 1.3; c,d – Sample 2.3.

Poster Session

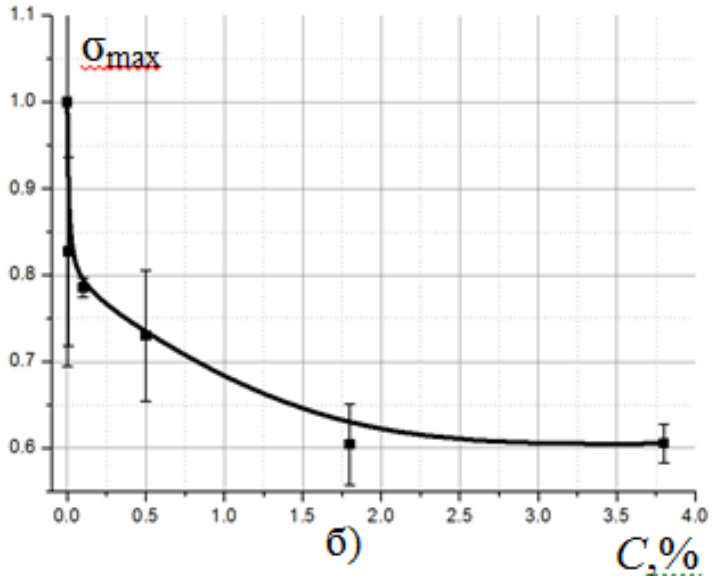




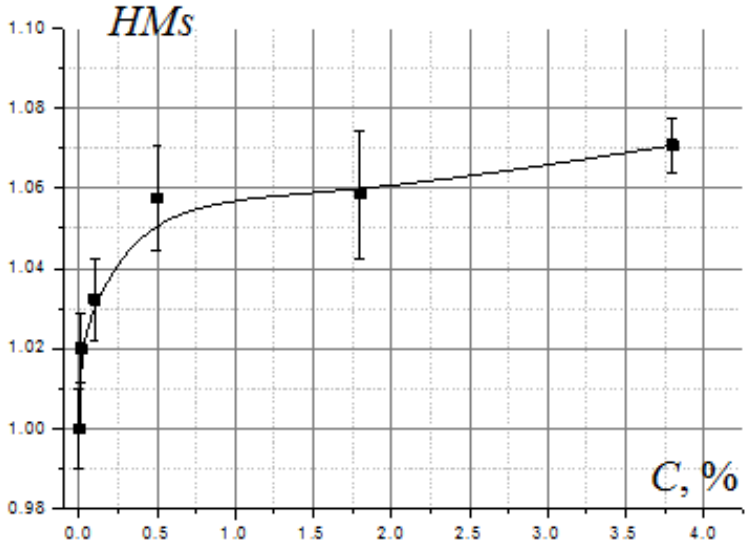
Poster Session



а)



б)



Poster Session

Conclusion

So, the nature of the polymer composite with crystallinity structure mechanical properties are different from such properties of polymer composite with amorphous structure, when the dispersed filler particles are used. The tensile strength and maximum deformation of polymer composite (fluoride-42) with crystallitic structure are decrease when the submicron filler particles adhesion to polymer matrix is increasing. There are not changes of fluoride-42 crystallinity when the filler concentration is less than 1%. The number of interfacial areas between the filler and crystallites are increasing and their sizes are change when filler particles concentration is increasing. This is determining the polymer composite mechanical properties decreasing. This can be explained by the mechanical stress gradient increasing at the interfacials areas.

Thank you!

Contacts: Maxim P. Danilaev
E-mail: danilaev.maxim@yandex.ru