

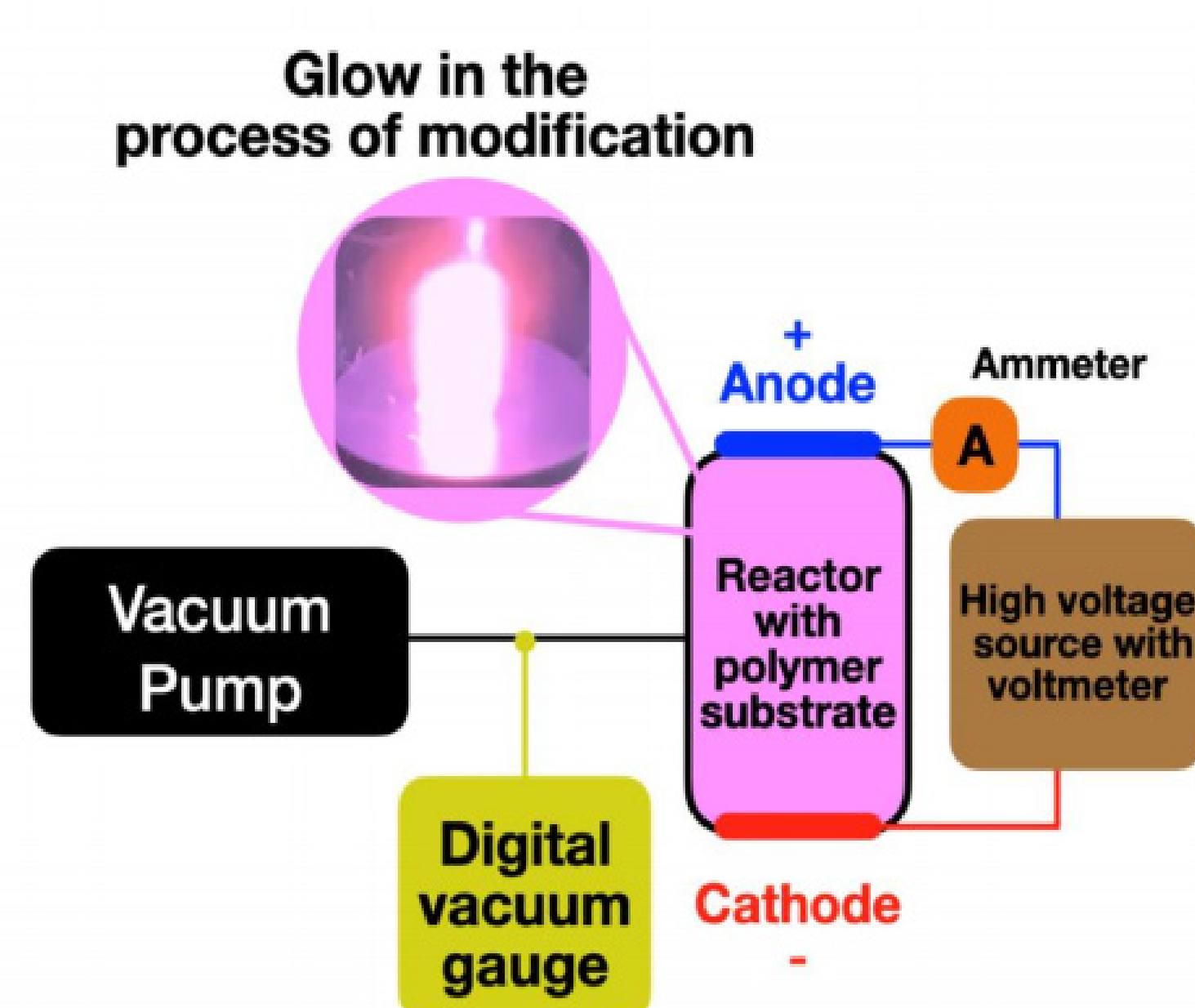
Effect of plasma treatment on chemical composition, structure and functional properties of polymers.

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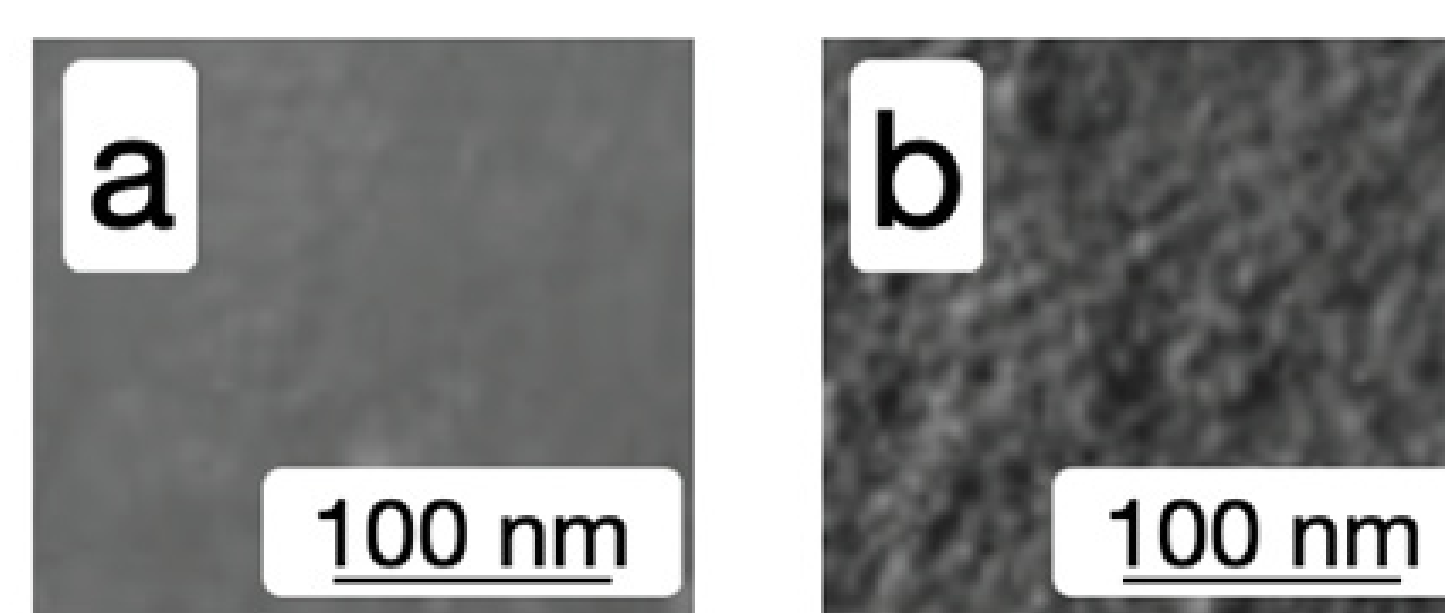
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Abstract

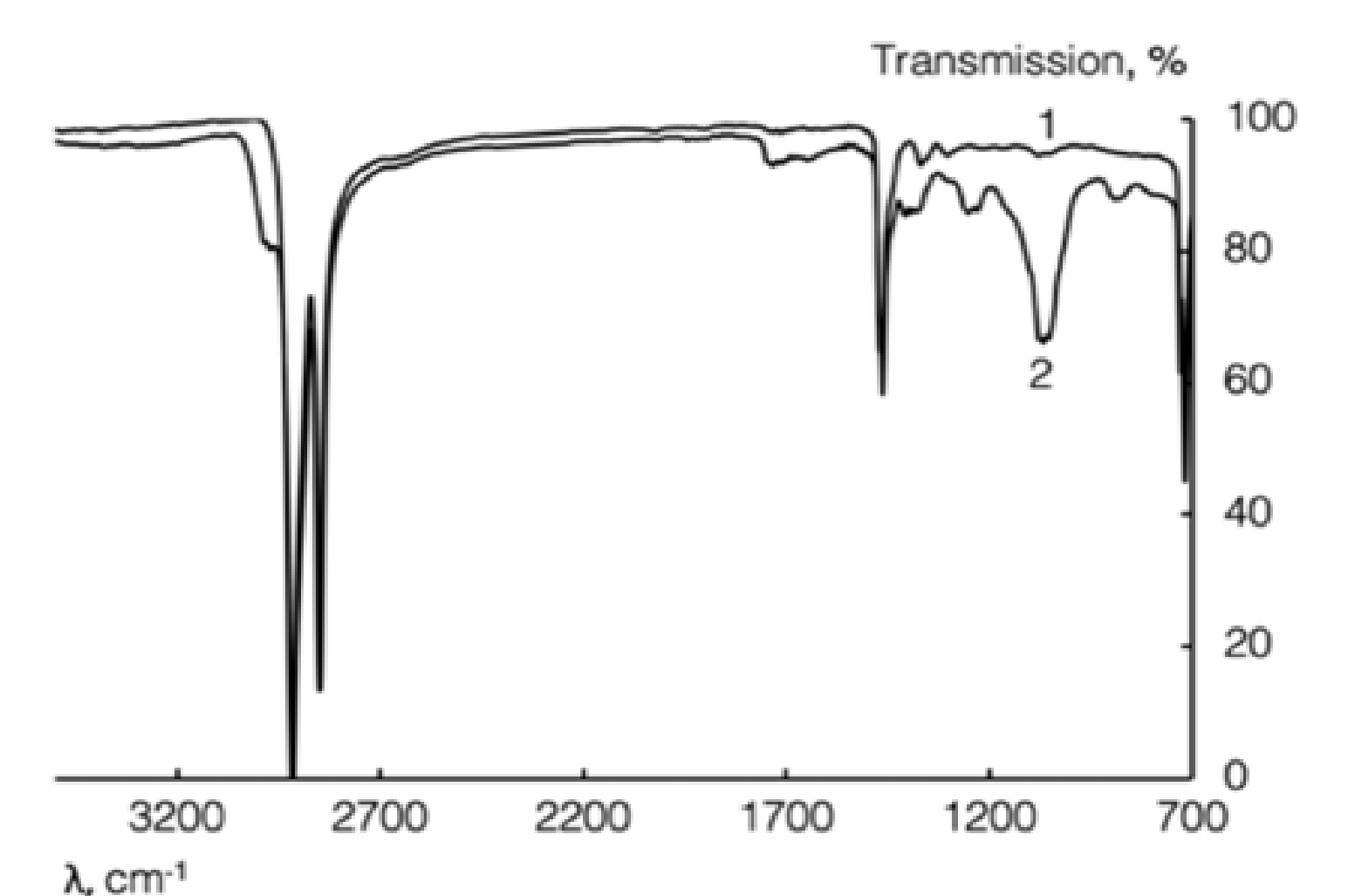
The work studied the effect of plasma-chemical treatment on the chemical composition, structure and functional properties of UHMWPE. It was found that the modification contributes to a 6-fold increase in the adhesion of the screen printing ink to the UHMWPE surface which is due to a significant transformation of the morphology and chemical composition of its surface layers and is confirmed by SEM analysis and IR spectroscopy.



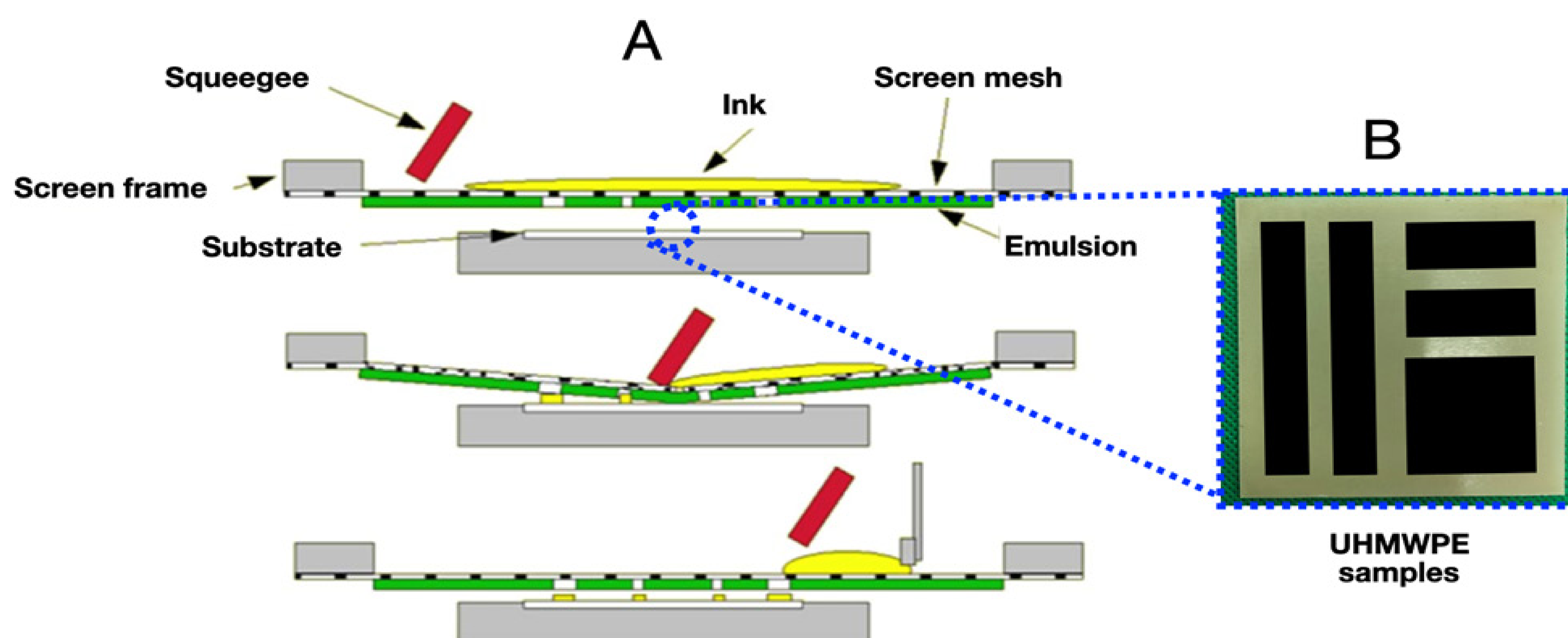
The diagram of a plasma-chemical plant for the polymer substrates processing



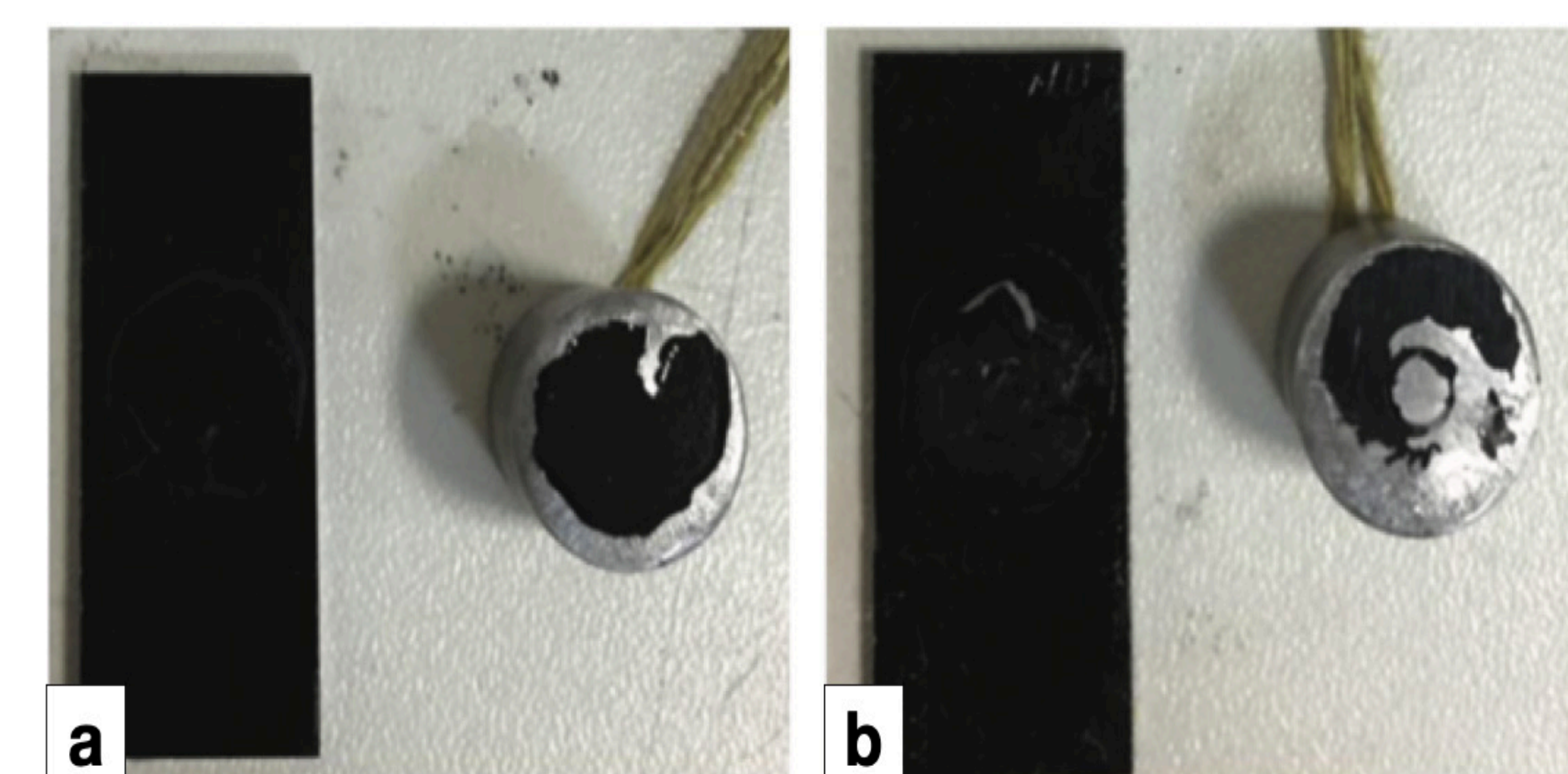
SEM-images of UHMWPE
SEM images of UHMWPE surface before (a) and after processing (b)



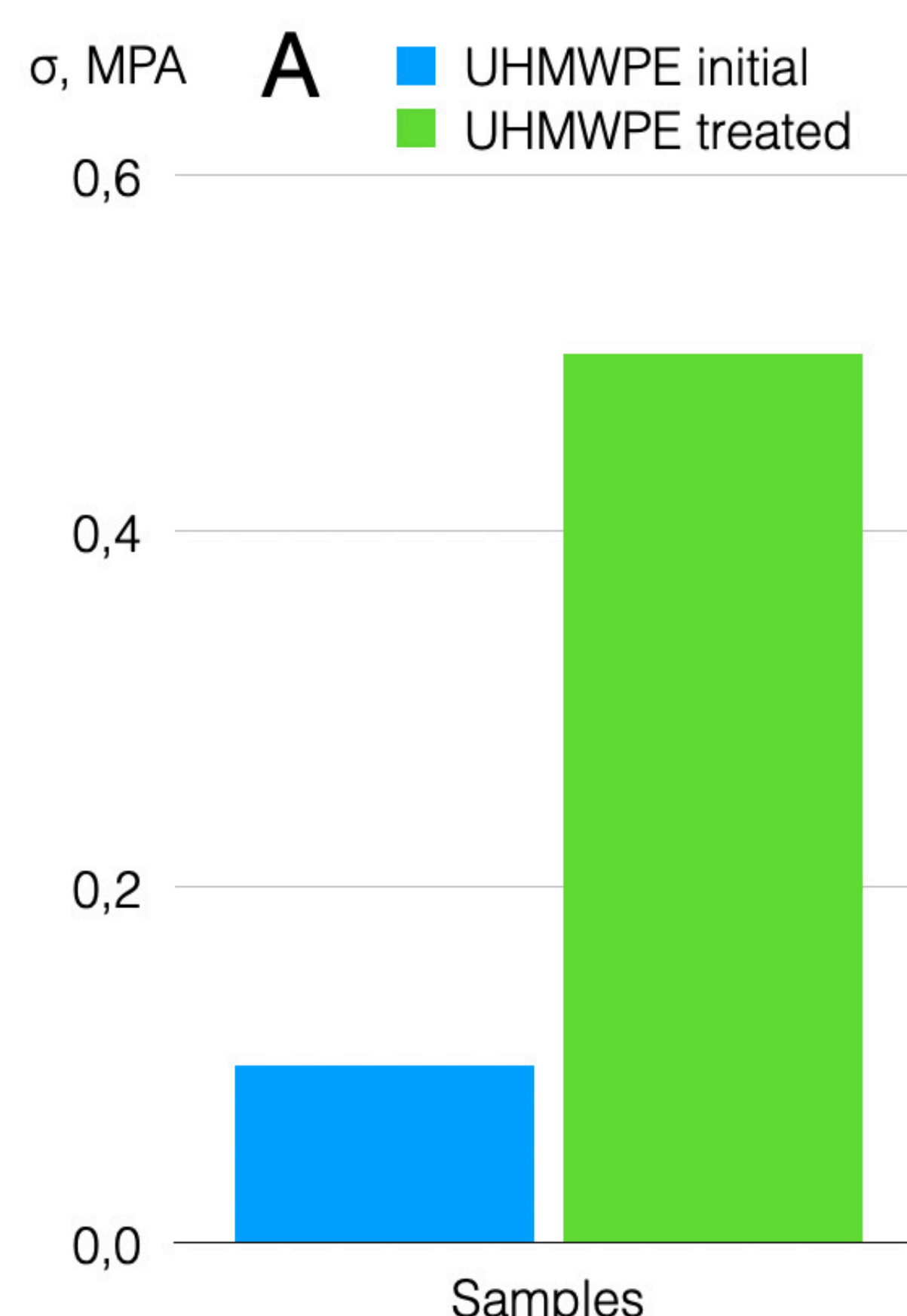
IR spectra of UHMWPE without filler:
1-initial, 2 – modified



Principle of screen printing (A) and UHMWPE with an applied ink impression (B)
(L. Yang, M. Chen, Z. Lv, S. Wang, X. Liu, S. Liu, Opt. Lett. (2013) 2240-2243)



The paint detachment from the UHMWPE composite:
a – the initial sample,
b – the plasma modified sample
(DOI: 10.1134/S2308112019030106)



Histogram of the strength values when ink is detached from the UHMWPE surface before and after plasma chemical treatment

It was found that the plasma-chemical treatment of UHMWPE made it possible to increase the adhesion of the screen printing ink to its surface by 6 times which is due to an increase in the surface energy from 28 to 44 mJ/m² as a result of the formation of oxygen-containing groups as a result of modification that is confirmed by the appearance new absorption bands in the range 1600-1700 cm⁻¹, according to the data of IR spectroscopy. It is obvious that the change in the UHMWPE roughness, along with the increase in surface energy, also makes a significant contribution to the quantitative increase in the screen printing ink adhesion to the polymer surface.

Acknowledgments

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