

EFFECTS OF THE PERMEATION ENHANCER EXCIPIENT ON THE PHYSICO-CHEMICAL PROPERTIES OF BUCCAL MUCOADHESIVE FILMS

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Introduction

The buccal administration of active ingredients by mucoadhesive films nowadays are one of the most innovative ways we can use to achieve systematic drug delivery.

The bases of buccal mucoadhesive preparations are polymers, which have mucoadhesive properties, such as hydroxypropylmethylcellulose (HPMC), chitosan or sodium-hyaluronate [1].

Plasticizer additives can be used in the film, to make the administration easier by increasing the elasticity of the preparations, for instance, glycerine or polyethylene-glycol [2].

Permeation enhancers are also used in buccal mucoadhesive films as additives, to improve bioavailability (e.g.: EtOH) [3].

In this research, we assayed sugar-esters as possible permeation enhancers for buccal use, which would be an absolutely innovative additive for this route of administration. We prepared sugar-ester containing films, and investigated the mechanical, structural and in vitro mucoadhesive properties of them.

Materials

Methocel® E-5 LV and E-15 LV (HPMC) was used as film forming polymer in the concentrations of 6.5-7.5-8.5 percent.

Ryoto® P1670 sugar-ester was added to the polymer solution in the concentration of 1 and 2 percent.

Experiments

For the polymer solutions we used distilled water as solvent. Solvent casting method was used for the preparation of the films on Teflon surface. Two different temperatures were used for the preparation of the solutions and the drying: room temperature and 50°C.

The composition of films:

Sample	c(HPMC)%	c(P1670)%	T(°C)
1.	8.5	0	25
2.	7.5	1	25
3.	6.5	2	25
4.	7.5	1	50
5.	6.5	2	50

We examined the identification crystalline form, in the films with X-ray powder diffractometry (XRPD). Spectra were recorded with a BRUKER D8 Advance diffractometer (Bruker AXS GmbH, Karlsruhe, Germany). The free volume structure was measured through the determination of the lifetime of o-Ps in the samples by positron annihilation lifetime spectrometry (PALS) with ORTEC PLS-system (3600 s; 10⁶Bq). The tensile strength was tested with a device and software developed in our Institute, the in vitro adhesion force of the film on mucin solution as well. The mucoadhesion force was examined by calculating the films' surface free energies (SFE) based on results from contact angle measurement with OCA 20 (DataPhysics Instruments GmbH).

Results and Discussion

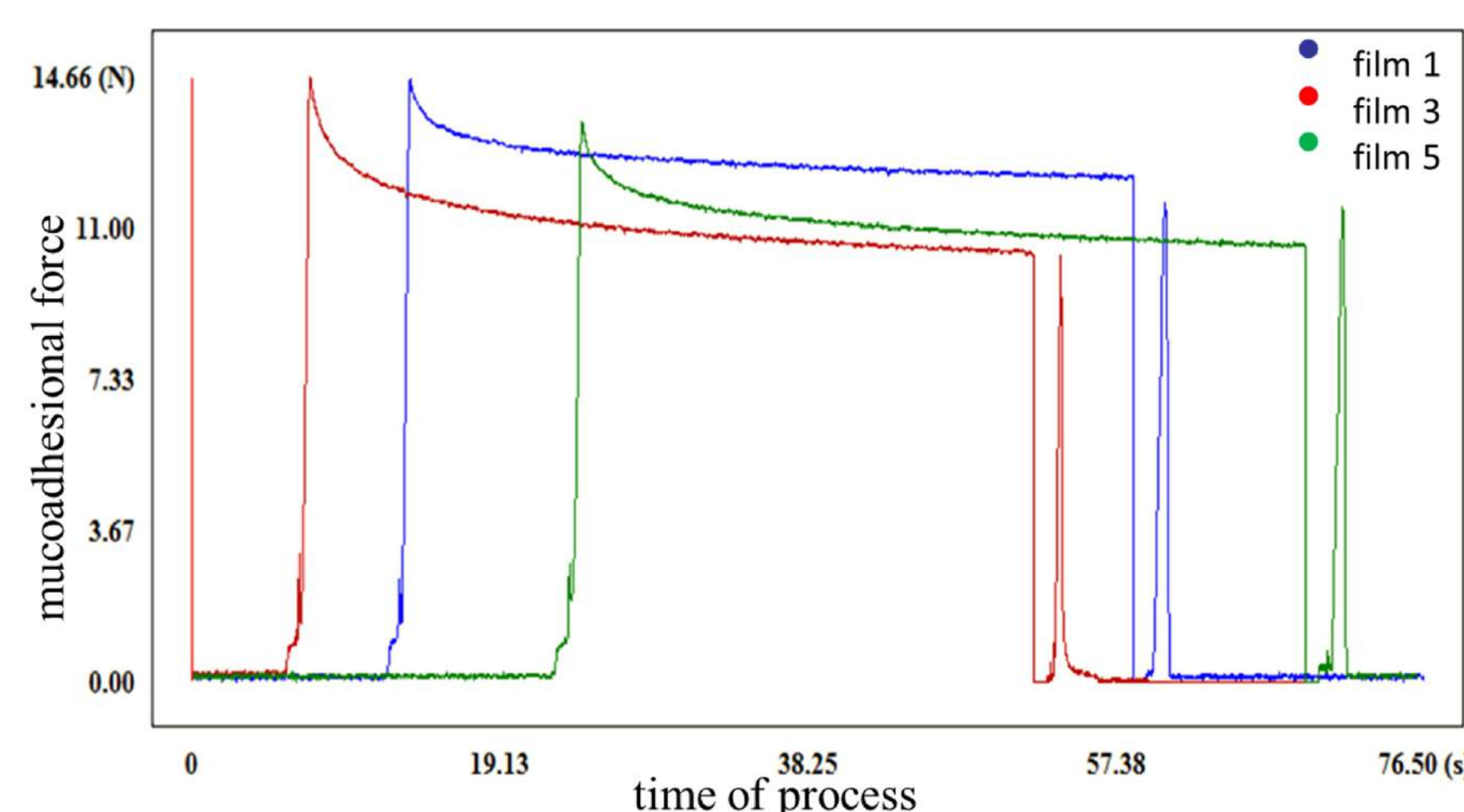


Figure 1: In vitro mucin adhesional curves of Methocel E-5 LV films

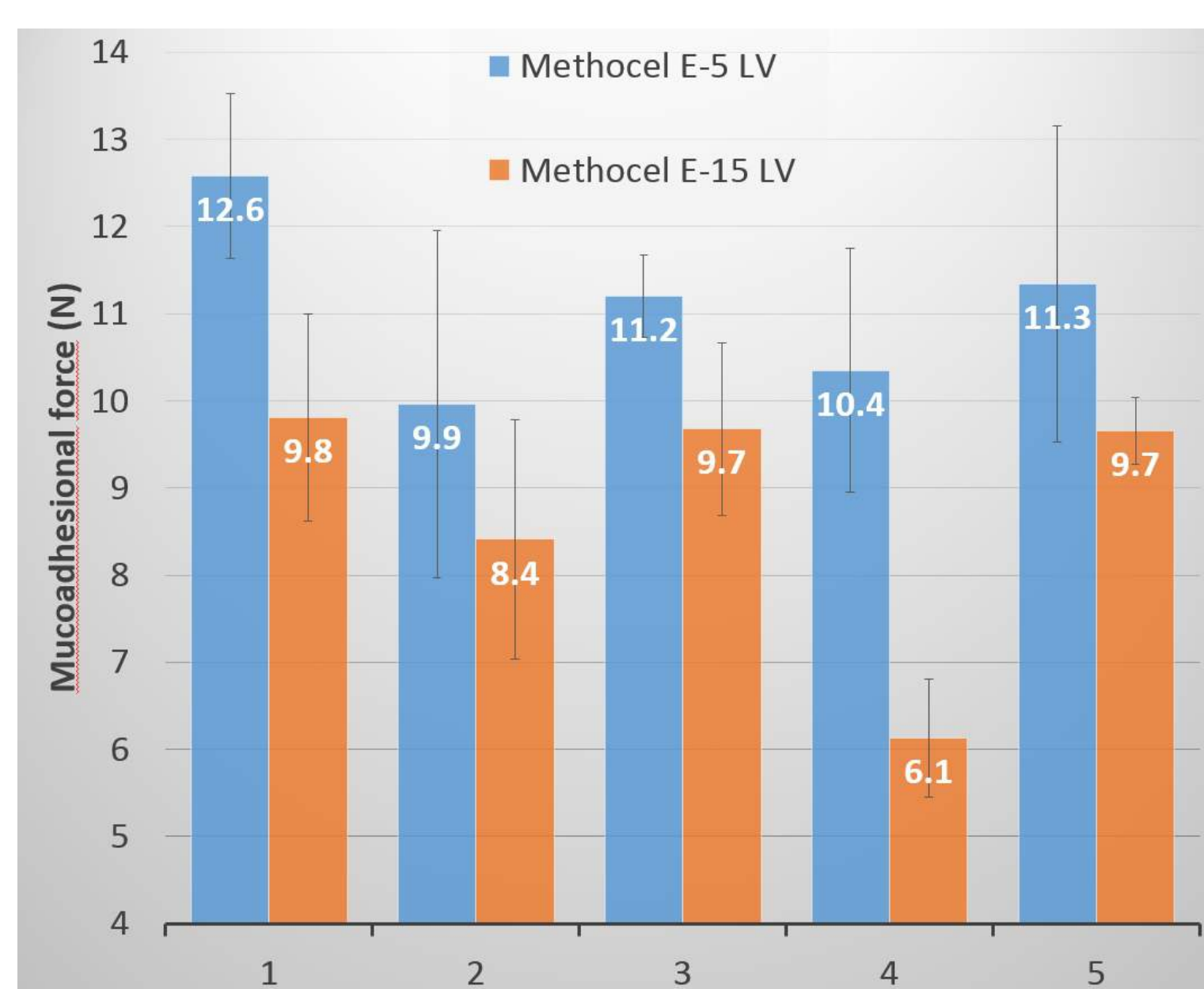


Figure 2: Mucoadhesional force of films

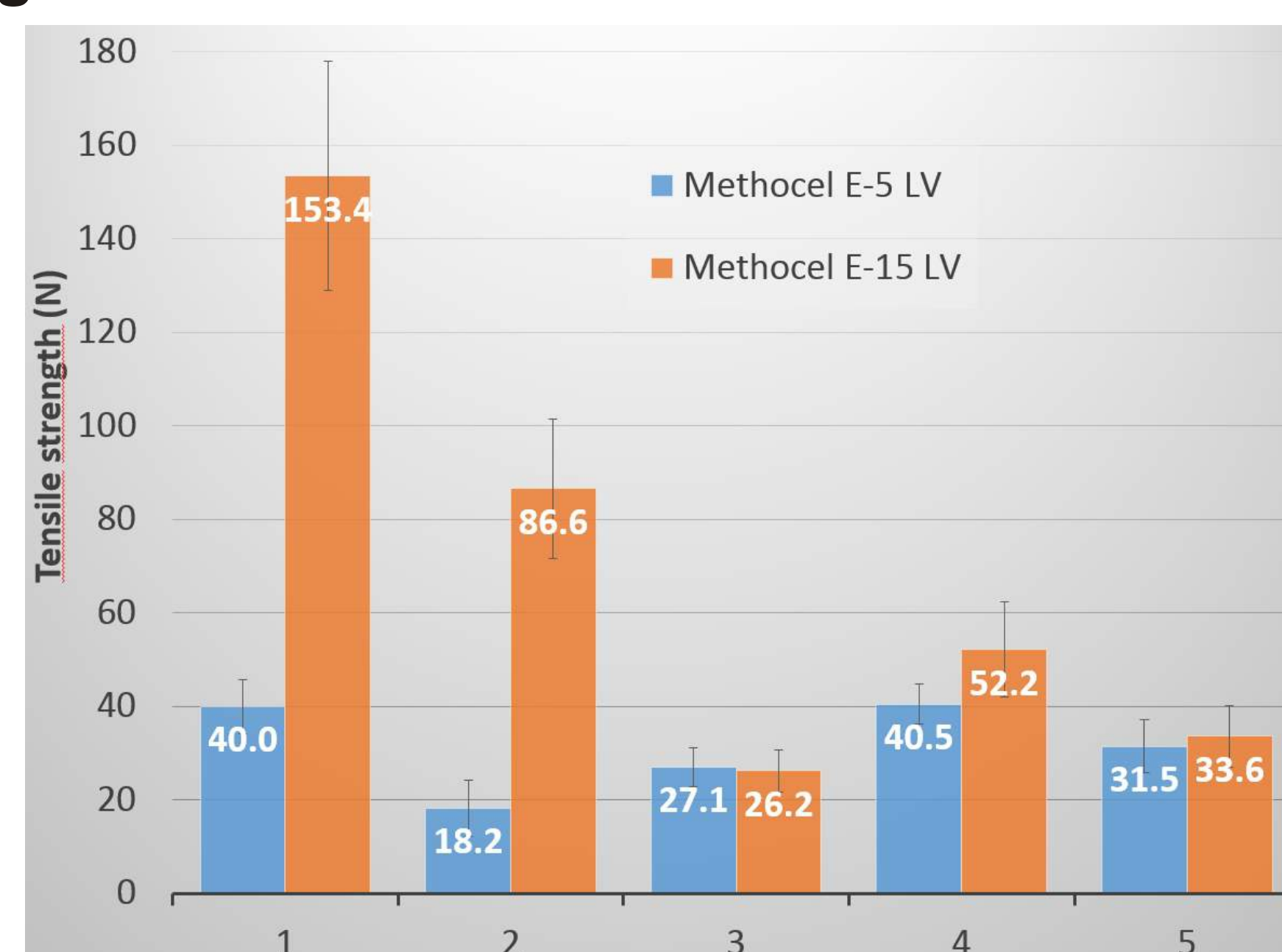


Figure 3: Tensile strenght of films

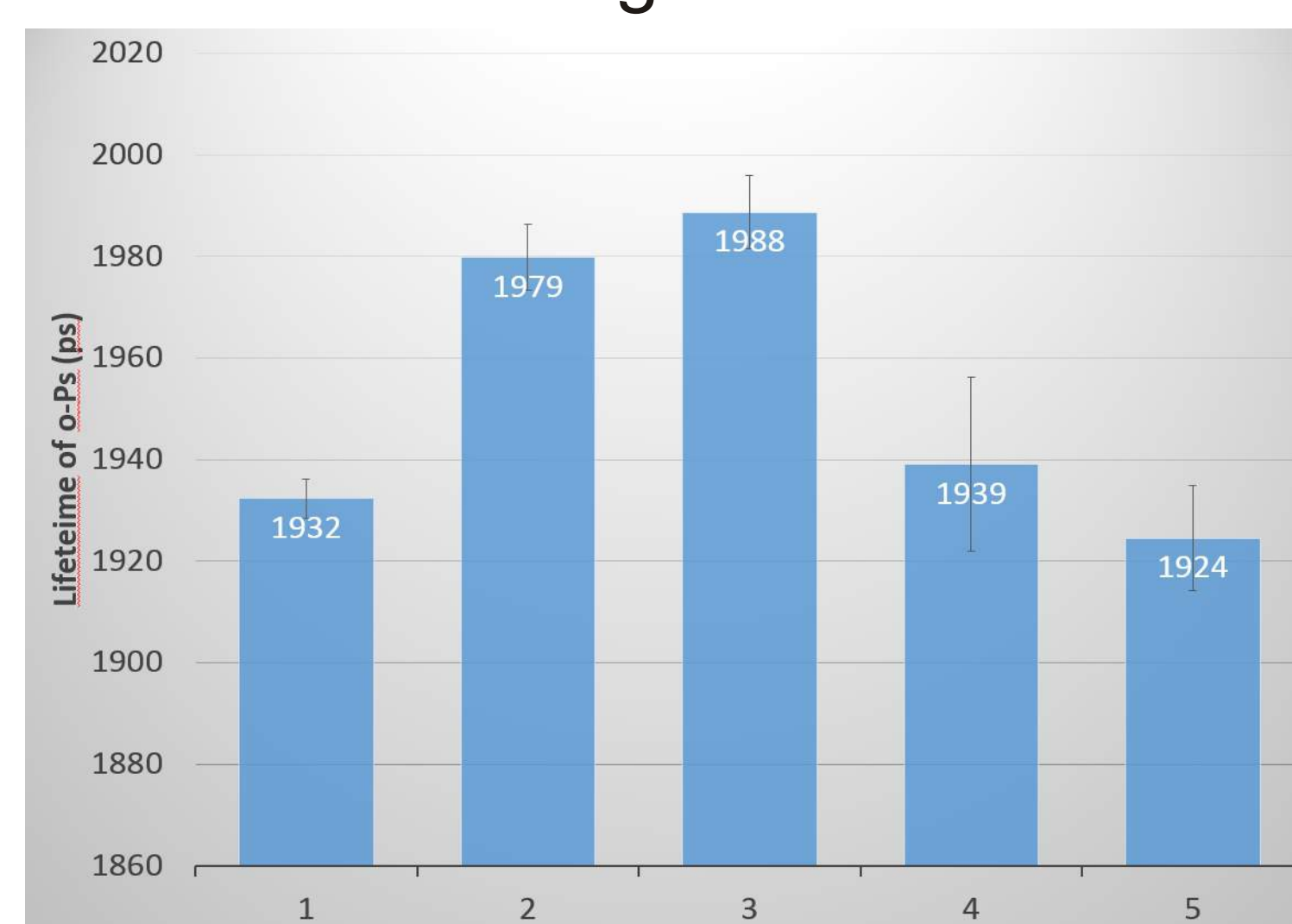


Figure 4: o-Ps lifetime values of Methocel E-5 LV films

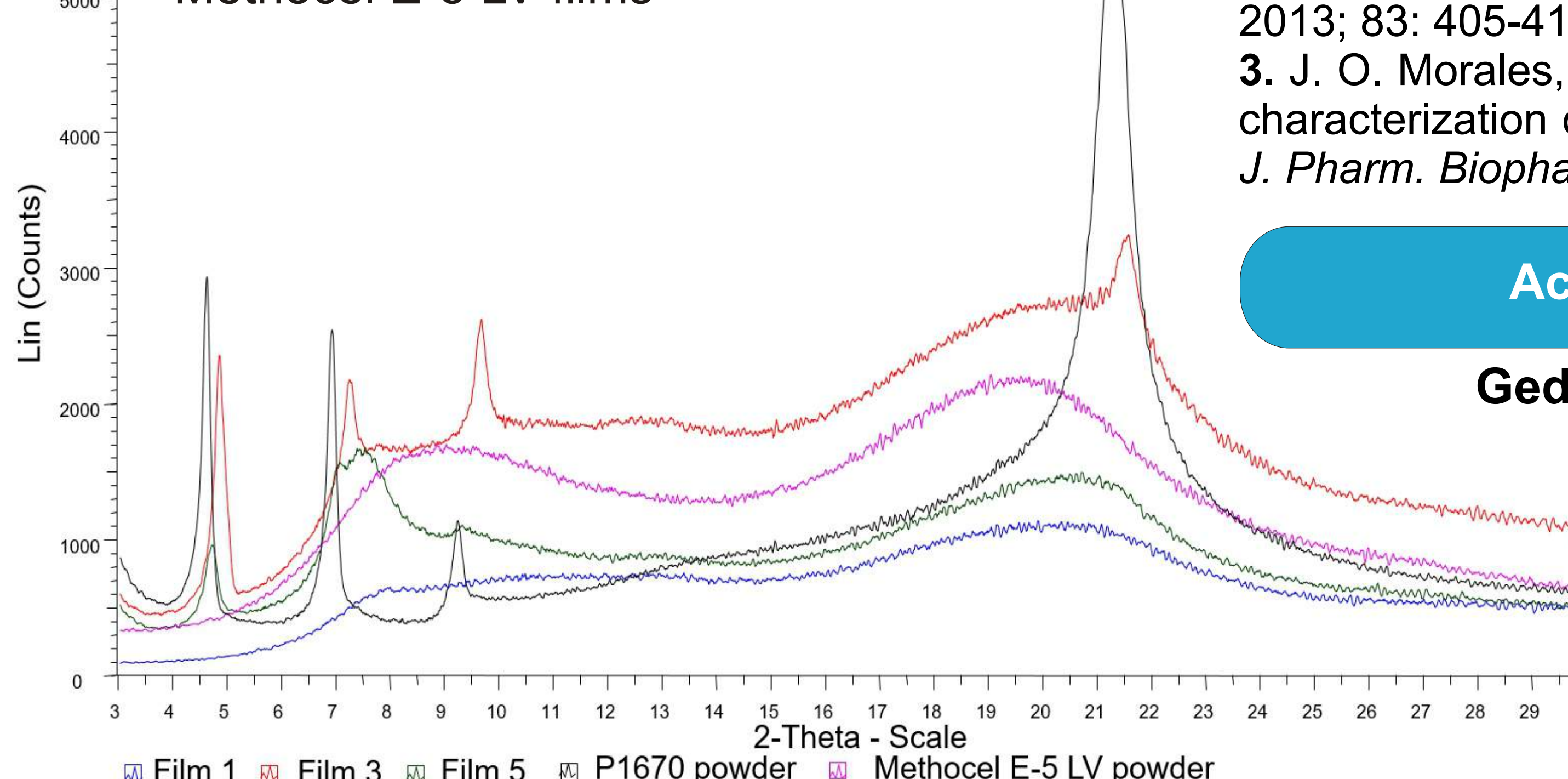


Figure 6: XRPD spectra of Methocel E-5 LV, P1670 powders and Methocel E-5 LV films

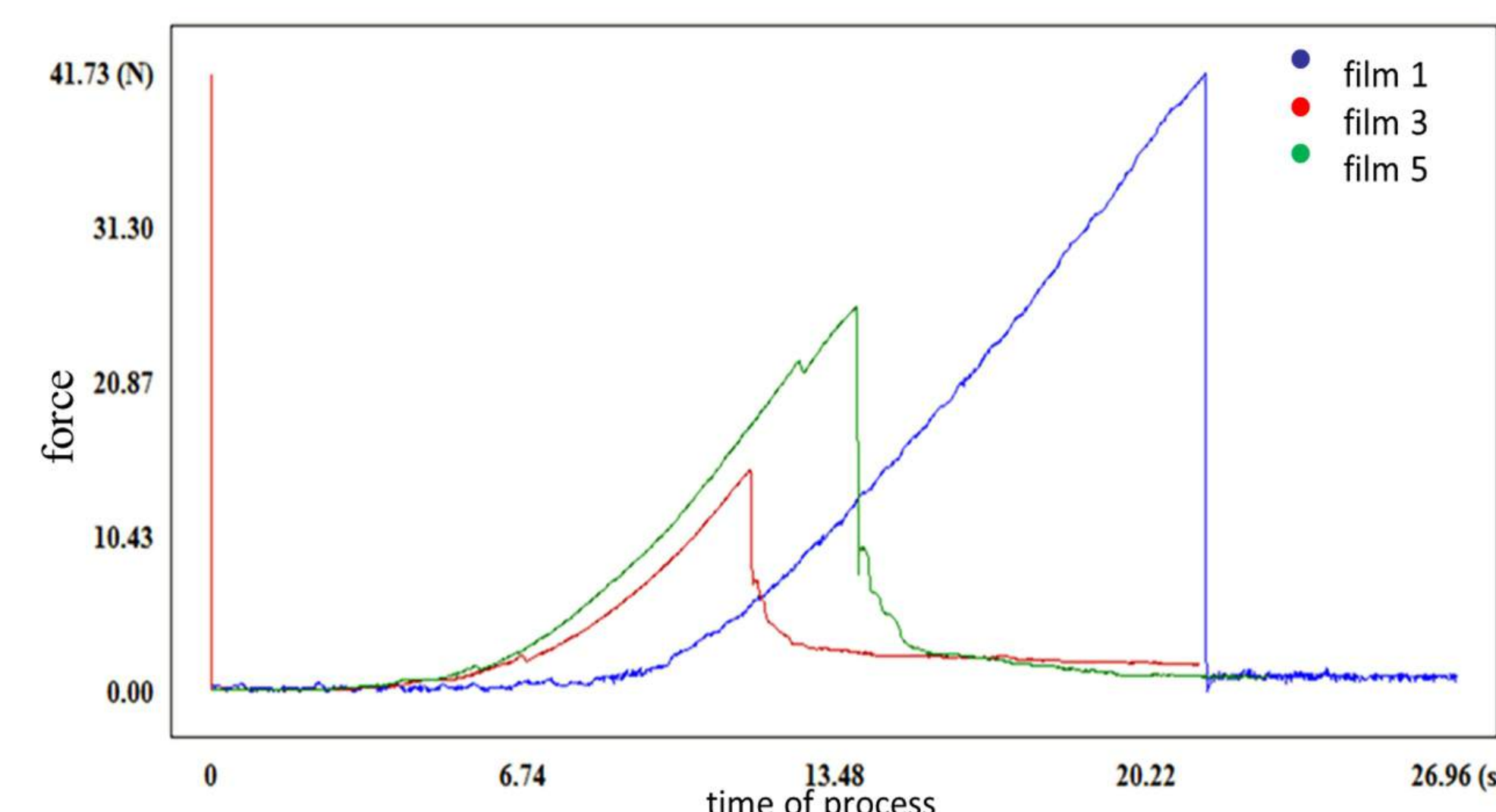


Figure 5: Deformation curves of Methocel E-5 LV films

Sample	γ^{tot} (mN/m)	γ^{d} (mN/m)	γ^{p} (mN/m)
P1670	71.11	27.01	44.10
M E-5	55.19	39.40	15.79
M E-15	55.04	39.86	15.18
Film 1 (M E-5)	64.40	38.01	26.39
Film 1 (M E-15)	55.74	37.22	18.52
Film 2 (M E-5)	67.18	30.30	36.87
Film 2 (M E-15)	65.59	35.35	30.24
Film 3 (M E-5)	67.68	37.08	30.60
Film 3 (M E-15)	67.07	34.28	32.79
Film 4 (M E-5)	68.50	30.13	38.36
Film 4 (M E-15)	64.79	35.84	28.95
Film 5 (M E-5)	70.54	32.08	38.46
Film 5 (M E-15)	70.16	30.98	39.18

Table 1: Surface free energy values of films

Conclusions

The permeation enhancer SE seems to have plasticizer properties also in room temperature casting, which is beneficial for the patient and profitable for the manufacturer.

The SE does not have a significant effect on the HPMC's good mucoadhesional properties.

The sugar-esters seem to be suitable additives as possible permeation enhancers for buccal mucoadhesive films.

References

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