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OF POLYMERIC MATERIALS**

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A CONTRIBUTION TO THE STUDY OF THE HYDROLYSIS OF POLY(ϵ -CAPROLACTONE)

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Many polymeric materials suffer hydrolysis when in direct contact with water. The study of this process is of great importance, not only for knowing the behaviour of the polymer but also to help prevent that undesirable phenomena.

To study whether the polymeric material poly- ϵ -caprolactone suffers hydrolysis, the sample was kept in water for some days and was weighted every day to determine the weight loss. In order to accelerate the process of hydrolysis the samples were kept in a thermal bath.

The experiment was carried out for 23 days and the results are presented in table 1.

Table 1 – Evolution of the weight of the polymeric tablets in time (g).

| Date | Sample n° | | | | | | | | | |
|-----------|-----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Day 0(1) | 1.3126 | 1.3260 | 1.3104 | 1.3187 | 1.3121 | 1.3110 | 1.3261 | 1.3210 | 1.3229 | 1.3265 |
| Day 1(2) | 1.3193 | 1.3334 | 1.3171 | 1.3269 | 1.3191 | 1.3180 | 1.3342 | 1.3288 | 1.3305 | 1.3336 |
| Day 2 | 1.3187 | 1.3354 | 1.3174 | 1.3257 | 1.3210 | 1.3179 | 1.3333 | 1.3294 | 1.3301 | 1.3351 |
| Day 6 | 1.3184 | 1.3323 | 1.3160 | 1.3257 | 1.3180 | 1.3172 | 1.3324 | 1.3295 | 1.3297 | 1.3330 |
| Day 7 | 1.3189 | 1.3317 | 1.3172 | 1.3256 | 1.3180 | 1.3169 | 1.3340 | 1.3268 | 1.3286 | 1.3329 |
| Day 8 | 1.3179 | 1.3333 | 1.3170 | 1.3244 | 1.3180 | 1.3175 | 1.3318 | 1.3269 | 1.3300 | 1.3352 |
| Day 9 | 1.3177 | 1.3316 | 1.3159 | 1.3240 | 1.3174 | 1.3164 | 1.3316 | 1.3267 | 1.3287 | 1.3323 |
| Day 10 | 1.3176 | 1.3313 | 1.3157 | 1.3239 | 1.3173 | 1.3164 | 1.3316 | 1.3267 | 1.3285 | 1.3317 |
| Day 13 | 1.3174 | 1.3312 | 1.3154 | 1.3238 | 1.3170 | 1.3160 | 1.3313 | 1.3262 | 1.3280 | 1.3312 |
| Day 15 | 1.3173 | 1.3312 | 1.3154 | 1.3238 | 1.3171 | 1.3161 | 1.3313 | 1.3263 | 1.3284 | 1.3313 |
| Day 21 | 1.3174 | 1.3310 | 1.3152 | 1.3244 | 1.3172 | 1.3160 | 1.3311 | 1.3262 | 1.3282 | 1.3312 |
| Day 22(3) | 1.3066 | 1.3207 | 1.3053 | 1.3134 | 1.3065 | 1.3056 | 1.3206 | 1.3162 | 1.3179 | 1.3208 |
| | Variation in weight (%) (4) | | | | | | | | | |
| WET | +0.366 | +0.377 | +0.366 | +0.432 | +0.389 | +0.381 | +0.377 | +0.394 | +0.401 | +0.354 |
| DRY | -0.457 | -0.400 | -0.389 | -0.402 | -0.427 | -0.412 | -0.415 | -0.363 | -0.378 | -0.430 |

(1) Before being put into water.

(2) 24 hours after being in water.

(3) After being in the oven under vacuum for 24 hours at 50°C.

(4) Calculated relatively to the initial weight:

$$\text{Variation} = (\text{final weight} - \text{initial weight}) / (\text{initial weight}) * 100 \%$$

The final weight is considered at day 21 for WET and at day 22 for DRY.

From this work it is possible to infer that in fact, when submitted for a period of 3 weeks to a thermal bath of water at 50°C, the polymeric tablets suffered a loss of weight of about 0.4%. That weight loss is most likely due to the decomposition of some molecules of the polymer by the action of the water molecules in an hydrolysis process.