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# Analysis of Starch-Sorbitol Films incorporated with ion ruthenium complexes

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In this work aimed to evaluate the influence of the ion complex charge from ruthenium(II) complex of the type, $[Ru^{II}(bpy)_2(NO_2)_2]^0$ (**[Ru]$^0$**) and $[Ru^{II}(bdq)(tpy)(NO_2)]^+$ (**[Ru]$^+$**), where bpy =2,2´-bipyridine, tpy =2,2':6',2"-terpyridine and bdq =3,4-diaminobenzoic acid on the thermal and adsorption properties. Starch (**S**) and sorbitol (**SB**) films were prepared by the casting method[1] and characterized by TG, ASAP and SEM technic. In our study, six films were prepared: Film 1 formed only **S**, film 2 **S** + **[Ru]$^0$**, film 3 **S** + **[Ru]$^+$**, film 4 **S** + **10%SB**, film 5 **S** + **10%SB** + **[Ru]$^0$**, and film 6 **S** + **10%SB** + **[Ru]$^+$**. The thermal stability from films 1 and 2, it was possible to observe that when the complex **[Ru]$^0$** was added, the thermal stability of the films decreased reasonably (Table 1). However, in comparison between films 1 and 3, the thermal does not vary significantly like in film 2. For the films 4, 5 and 6, the thermal stability decreases in the series (4 > 5 > 6). SEM images from films 3 and 6 present reliefs differently of films 2 and 5. It was probably, justified by ion complex hydrophilicity. In the ASAP technique, it was possible to obtain dates based on BET area (surface area), pore size and volume (Table 1). In the films with only **S**, the ion complex **[Ru]$^+$** increase the pore size and volume (macropore), while the **[Ru]$^0$** decreases the pore size (mesopore) and increase the BET value. The **SB** increases the BET value and present macropore when added in the **S** formulation. Film 6 presented characteristics of non-porous material. These results show the influence of positive ion complex charge on the decrease of the thermal stability and increase of pore size in compare to neutral ion on **S** and **S** + **10%SB** films.

**Table 1**: TGA and ASAP data obtained from the films

| | TG | | ASAP | | |
|---|---|---|---|---|---|
| **Films** | **$T_{1°\ event}$(C°)** | **$T_{2°\ event}$(C°)** | **BET ($m^2/g$)** | **Pore size (nm)** | **Pore volume ($cm^3/g$)** |
| **1** | 280 | 396 | 0.0771 | 24 | 0.000471 |
| **2** | 237 | 363 | 0.3211 | 10 | 0.000824 |
| **3** | 260 | 322 | 0.0236 | 238 | 0.001410 |
| **4** | 264 | 349 | 0.1206 | 22 | 0.000652 |
| **5** | 248 | 356 | 0.0122 | 470 | 0.001429 |
| **6** | 242 | 331 | - | - | 0.000431 |

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**References**

[1] M.D. Hazrol, *et al.*, *Polymers*, **13(2)**, 242, (2021).