**Supplementary material**

**2. Materials and Methods**

**Factorial Design**

In this method, all variables have their values ​​changed simultaneously with the objective of verifying the influence of one or more variables (k), at different levels (n), on the response of interest (1). The total number of experiments (N) is given by Eq. 1.

(1)

**3. Results and Discussion**

**Factorial Design Statistical Analysis**

The calculated effects of the electrochemical parameters are shown in Table 1. The positive values ​​mean an increase in the value of the variable when there is a change from the low to the high level. The negative values ​​mean a decrease in the parameter when there is a change from the low to the high level.

Table 2. Calculated effects values of the experimental conditions on the parameters VSS and OA, units in Volts.

|  |  |  |
| --- | --- | --- |
| Parameters | VSS (V) | OA (V) |
| Mean Value | 366.81±0.61 | 3.84±0.04 |
| Main Efects |  |  |
| Current Density (*j*) | 1.40±1.22\* | -1.41±0.08 |
| Temperature (*T*) | 7.63±1.22 | 0.08±0.08\* |
| Electrolyte Concentration (*[H3PO4]*) | 106.11±1.22 | 6.24±0.08 |
| Cross Effects |  |  |
| *j - T* | -0.12±0.08\* | 2.81±1.22\* |
| *j - [H3PO4]* | -1.27±0.08 | -5.08±1.22 |
| *[H3PO4] - T* | -0.14±0.08 | -5.52±1.22\* |
| *j – T -[H3PO4]* | 0.11±0.08\* | 0.97±1.22\* |

\* Effects without statistical significance in the analyzed parameter according to t-student.

Table 2 presents the main effects, i,e., variable effects, as well as the cross effects, meaning the mixed influence of 2 or more variables in the response.

**References**

1. Bruns RE, Scarminio IS, Neto B de B. Statistical Design - Chemometrics, Volume 25 (Data Handling in Science and Technology). Elsevier Science; 2006. 422 p.