

Coherence in the Ferroelectric $A_3\text{ClO}$ ($A = \text{Li, Na}$) Family of Electrolytes

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Graphs in Figure 2d can be obtained using wxMaxima 20.06.6, the Runge-Kutta method and the macros:

x vs time:

```
(%i1) eqs: [y,-x+5*(1-x^2)*y-50*sin(7*t),1]$
(%i2) v: [x,y,t]$
(%i3) v0: [0.001,0,0]$
(%i4) p: rk(eqs,v,v0,[t,0,50,0.01])$
(%i5) last(p);
(%o5) [50.0,-
2.102520981419923,1.654017020965303,49.99999999999862]
(%i6) plot2d ([discrete,makelist([s[1],s[2]],s,p)],
[xlabel,"t"],[ylabel,"x(t)],[legend,false],[nticks,30]);
```

Phase portrait:

```
(%i1) eqs: [y,-x+5*(1-x^2)*y-50*sin(7*t),1]$
(%i2) v: [x,y,t]$
(%i3) v0: [0.001,0,0]$
(%i4) p: rk(eqs,v,v0,[t,0,50,0.01])$
(%i5) last(p);
(%o5) [50.0,-
2.102520981419923,1.654017020965303,49.99999999999862]
(%i6) plot2d ([discrete,makelist([s[2],s[3]],s,p)],
[xlabel,"x(t)],[ylabel,"y(t)],[legend,false],[nticks,30]);
```

References:

1. Maxima software <https://maxima.sourceforge.io/> (Accessed on 04.05.2021).
2. Jaime Villate. *Dinâmica e Sistemas Dinâmicos*. 2019
<https://books.fe.up.pt/index.php/feup/catalog/book/978-972-99396-5-5> (Accessed on 04.05.2021).