一种分数阶压控忆容器模型及其电气特性分析

赵恢寿 1 ，甘朝晖 1 ，张士英 1 ，王庆国 2
(1 武汉科技大学 信息科学与工程学院，湖北 武汉 430081；
2 武汉科技大学 汽车与交通工程学院，湖北 武汉 430081)

摘 要：忆容器是具有记忆功能的非线性电容.近年来，研究人员已经提出了一些整数阶忆容器模型，并分析了整数阶忆容器模型在不同类型信号激励下的响应特性，而分数阶忆容器的研究还比较少.在分析了现有整数阶忆容器模型的基础上提出了一种分数阶压控忆容器模型，并对该分数阶忆容器模型在正弦信号激励下的响应进行了实验分析，结果表明该模型能够正确地模拟忆容器的特性.分数阶阶次和非线性窗函数中的控制参数对分数阶忆容器电气特性的影响规律也得到了分析和总结,这些结果对忆容器的应用具有一定的参考价值.

关键词：忆容器；分数阶；模型；幅频特性

A Fractional Order Voltage Controlled Memcapacitor Model and its Electrical Characteristic

ZHAO Hui-shou 1 , GAN Zhao-hui 1 , ZHANG Shi-ying 1 , WANG Qing-guo 2
(1 Institute of Information Science and Engineering, Wuhan University of Science and Technology,
Wuhan 430081, China； 2 Institute of Automotive and Transportation Engineering,
Wuhan University of Science and Technology, Wuhan 430081, China)

Abstract：Memcapacitor is a nonlinear capacitor with memory function. In recent years, researchers have proposed a number of integer-order memcapacitor model, and analyzed the response characteristics of integer-order memcapacitor model under different types of excitation, but the research of fractional-order memcapacitor is less. In the paper, based on the analysis of the existing integer-order memcapacitor model, a fractional-order voltage controlled memcapacitor model is proposed, and the responses of the fractional-order memcapacitor model with nonlinear window function excited by sinusoidal signal is analyzed. The experimental results show that the model can simulate the characteristics of memcapacitor correctly. The influences of fractional order and control parameters of the window function on the electrical characteristics of the fractional-order memcapacitor have also been analyzed and summarized. These results have a certain reference value for some applications of memcapacitor in various fields.

Key words：memcapacitor; fractional-order; model; electrical characteristic

作者简介：
赵恢寿 ，（1990-），硕士研究生.研究方向为忆阻器、非线性电路.
甘朝晖（通讯作者） ，(1969-)，博士，教授.研究生导师.研究方向为忆阻器、非线性电路.E-Mail:ganzh11@aliyun.com
张士英 ，（1991-），硕士研究生.研究方向为非线性电路.
王庆国 ，(1974-)，博士，副教授，硕士生导师.研究方向为数字制图、GIS 教学和忆阻器、非线性电路.