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针对新型HfO_2栅介质改进的四元件电路模型

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摘要 针对超薄HfO_2栅介质MOS电容，提出改进的四元件小信号等效电路模型，修正了双频C-V法，增加了串联寄生电阻和串联电感两个参数．结合双频测量结果计算出修正的C-V曲线，消除了高频时的频率色散现象，而且曲线更加接近理想C-V曲线．通过实验结果提取了寄生参数值并拟合出各元件值与MOS电容面积和反型层厚度的解析表达式．实验测量和理论计算表明该方法可提高通常C-V法的测量精度．

关键词 二氧化铪 双频C-V法 四元件电路模型 频率色散

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Improved two-frequency method with the four-element circuit model for the novel HfO_2 as the gate dielectric

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Abstract

<P>For the MOS capacitance with the ultra thin hafnium oxide, an equivalent four-element circuit model including the additional series resistance and series inductance is proposed to be employed in the two-frequency C-V correction. These extracted parameters by independently measuring the capacitor at two different frequencies eliminate the frequency dispersion at high frequencies. The corrected C-V curves agree with the theoretical calculation very well. The parameters are extracted, and the relationships between the components’ values, the capacitance area and the inversion layer thickness are also presented in the paper. Experimental and theoretical results show that the model can be incorporated in the routine C-V measurement procedure and provide more accurate data.

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Key words HfO_2 two-frequency C-V measurement four-element model frequency dispersion

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