After the nonlinear correction, the output characteristic wave of the sensor is shown in Fig.3. It can be seen that the curve is linear. The relative error curve of corrected sensor shown in Fig.4 indicates the relative error is less than 2.0% in the whole range, which can meet the measurement requirements of the moisture content of green sand.

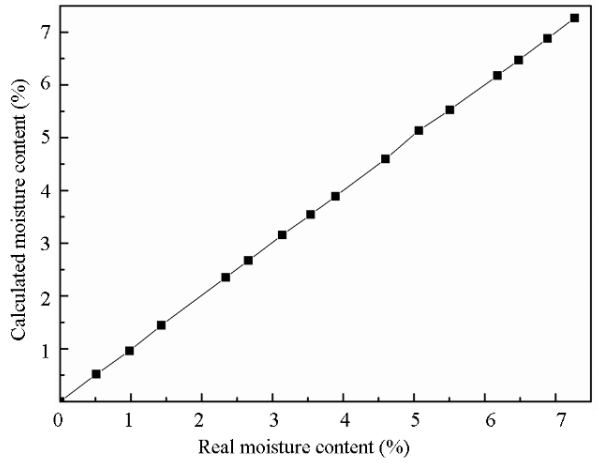

Figure 3 Output characteristic wave of the sensor after nonlinear correction

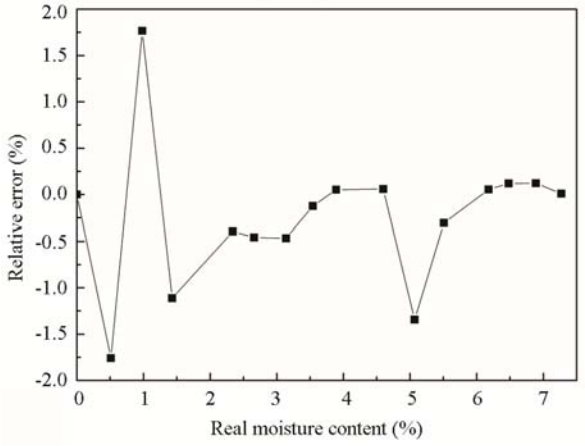

Figure 4 Relative error curve of corrected sensor

V. CONCLUSIONS

The principle of measuring the moisture content of green sand by the capacitance method is introduced. The moisture content is measured according to the fact that the dielectric constant of green sand has the single-valued relationship with the moisture but without the other components. Based on these, the reason of causing the nonlinearity is theoretically analyzed, and the higher order harmonics are main causes. The influencing factors, including the measured green sand sample, sensor structure and manufacturing process, leakage resistance and environmental factors are discussed. Then, a nonlinear compensation method based on the least squares is given to reduce the influence of the nonlinearity. The experiments show that the capacitance moisture sensor can keep a good linear relationship between the input and the output and the error is less than 2.0%, which can meet the requirements of measuring the moisture content of green sand.

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