

Roasting Degree of Cocoa Beans by Artificial Neural Network (ANN) Based Electronic Nose System and Gas Chromatography (GC)

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Abstract : Roasting is one critical procedure in chocolate processing, where special favors are developed, moisture content is decreased, and better processing properties are developed. Therefore, determination of roasting degree of cocoa bean is important for chocolate manufacturers to ensure the quality of chocolate products, and it also decides the commercial value of cocoa beans collected from cocoa farmers. The roasting degree of cocoa beans currently relies on human specialists, who sometimes are biased, and chemical analysis, which take long time and are inaccessible to many manufacturers and farmers. In this study, a self-made electronic nose system consists of gas sensors (TGS 800 and 2000 series) was used to detecting the gas generated by cocoa beans with a different roasting degree (0min, 20min, 30min, and 40min) and the signals collected by gas sensors were used to train a three-layers ANN. Chemical analysis of the graded beans was operated by traditional GC-MS system and the contents of volatile chemical compounds were used to train another ANN as a reference to electronic nosed signals trained ANN. Both trained ANN were used to predict cocoa beans with a different roasting degree for validation. The best accuracy of grading achieved by electronic nose signals trained ANN (using signals from TGS 813 826 820 880 830 2620 2602 2610) turned out to be 96.7%, however, the GC trained ANN got the accuracy of 83.8%.

Keywords : artificial neuron network, cocoa bean, electronic nose, roasting

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