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Detection of metallic contaminants in foodstuffs by SQUID

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Recently, opportunities to eat processed foodstuffs are increasing in our daily life. Therefore there is a chance that unfavorable contaminants are accidentally mixed with food. For example, they are small chips of processing machines and also broken syringe needles used for immunization shot or hormone injections, which are mostly metallic materials. According to the increase of international concern regarding food safety, we should develop a high sensitive detector to ensure the safety. Although an iron particle detection system has been already developed, there is no system for food contaminants. It is difficult to detect all the materials by one detection system. However, if targets are limited to metallic contaminants, high-Tc SQUID is one candidate as a sensitive detector for contaminants in foodstuffs.

Our target is mainly detection of a stainless steel contaminant in meat. Since the conductivity of the austenitic stainless steel is low, it is difficult to detect it using a conventional eddy current method. An austenitic stainless steel material is originally non-magnetic. However it shows properties like a ferromagnetic material after martensitic transformation during its manufacturing process. Therefore the most of stainless steel contaminants can be magnetized. So the samples should be magnetized by a strong permanent magnet before measurement to obtain a higher sensitivity. We constructed a demonstration plant system with size of 3305L x 1290W x 1610H. The system could successfully detect stainless steel cut needle with length of 2 mm at 200mm far from the SQUID sensor.

In this paper, we describe the system for small stainless steel contaminants in foodstuffs by using high-Tc SQUID magnetometer.