High-T$_c$ SQUIDs System for Detection of Magnetic Contaminants in Food or Beverage

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A PC controlled high sensitive food contaminant detector was designed and constructed. There is a possibility that individuals ingest contaminants that have been accidentally mixed with food because processed foods have become very common. Therefore a detection method of small contaminants in food and pharmaceuticals is required. The system we have developed is the High-T$_c$ SQUID based system, which is covered with waterproof stainless steel plates and acceptable to HACCP (Hazard Analysis Critical Control Point) program. The outer dimension of the system is 1510mmL x 215mmW x 870mmH and an acceptable object size is 200mmW x 80mmH. An automatic liquid nitrogen filling system was installed in the standard model. This system employed double layered permeable metals with thickness of 1mm as a magnetically shielded box. The distribution of the magnetic field in the box was simulated by FEM (*Maxwell*, Ansoft Corporation); the gap between each shield layer was optimized before fabrication. Then the shielding factor of 1/730, which is good enough to operate the system in a factory, was achieved in z- component. As a result, we robustly detected a steel ball as small as 0.3 mm in diameter with distance of 80mm above the object. There is also a strong demand for detection of metallic contaminants in minced flesh or juice with pulp because a strainer cannot be applied to such a pulpy liquid. We are developing the detection system based on high-T$_c$ SQUID for a beverage. The detail of the system will be also discussed.