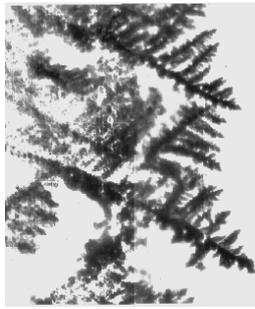


	Experiment title: Magnetization distribution in Fe arborescences grown by Electrodeposition	Experiment number: HE 1065
Beamline: ID21	Date of experiment: from: 06 June 01 to: 11 June 01	Date of report: 01 March 02
Shifts: 15	Local contact(s): Dr. Jean Susini	<i>Received at ESRF:</i>
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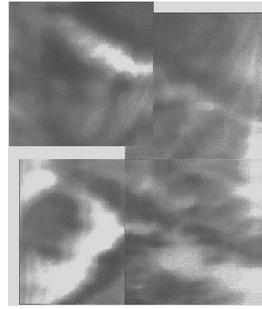
Report:

Complex patterns emerging from non-equilibrium and irreversible phenomena, either physical, chemical, or biological, abound in nature and are actively studied. Our interest is to investigate the effect of an applied magnetic field on the morphology of magnetic growth and to study how the very irregular morphology, with sometimes a fractal character, is reflected in magnetic properties. For this we investigate pattern formation in the electrochemical deposition of a magnetic metal, Fe, from a thin layer of Fe (SO₄) aqueous solutions, in a circular geometry without and with an applied magnetic field. From the μ -X-MCD, experiment we expected to get a microscopic insight of how the magnetisation is distributed in the Fe arborescence grown under zero as well as under an applied magnetic field and how that distribution reflects the particular morphology of the arborescences. The experiment was performed at the K edge of Fe, with a beam energy of 7.14 KeV. The images of the absorption of the samples revealed that the aggregates were much thinner than expected by a factor of 100. The μ -X-MCD signal, which is of the order of 10^{-3} of the total absorption of the sample at the K edge of Fe, was then impossible to observe.

Nevertheless different parts of the aggregates were scanned and images reflecting the absorption were obtained, allowing to estimate the thickness of the growth: those samples are between 0.3 μ m and 1 μ m thick. The spatial resolution was poor, of the order of 5 μ m, since the optics was designed for the μ -X-MCD experiment. Figure 1 shows the X-rays μ absorption image together with the corresponding optical image of the sample.



a



b

Figure 1. Optical image of an arborescence of Fe grown under an in plane magnetic field (a), image of the absorption of the same part of the sample (b) (images size: $345 \times 290 \mu\text{m}^2$)

Before this experiment no precise information about the thickness of the arborescences was known. So, even if the goal of measuring the magnetisation distribution was not achieved, the estimate of the thickness is an important result. X-rays μ absorption seems to be the appropriate tool to study the thickness of the growths and to obtain the information on this aspect of the morphology, which is usually ignored. A proposal to perform such an experiment on ID21, with a much better spatial resolution (about 50nm) will consequently be submitted.