ESRF	Experiment title: In situ characterization by synchrotron X-ray diffraction of the reversible stress-induced martensitic transformation in superelastic titanium-based alloys	**Experiment number**: MA - 2680
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Shifts: 12	**Local contact(s)**: Andy Fitch	*Received at ESRF:*

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Report:

Metastable β titanium alloys are currently investigated as Ni-free biomedical alloys. These alloys can be subject to a reversible stress-induced martensitic (SIM) transformation from the β phase (austenite) to the α" martensitic phase. In order to characterize this reversible stress-induced martensitic transformation, in situ cyclic tensile tests were performed on several titanium-based superelastic alloys.

Cyclic tensile tests consisted of strain increments of 0.5% until 5% of applied strain, each step being followed by a total release of the stress. Further cycles until 6%, 8% and 10% were then also done. X-ray diffractograms were acquired for each cycle under loading condition (the stress being still applied) and after unloading (without any stress) to investigate the reversibility of the SIM transformation. The duration of one in situ experiment was about 6-8 hours.

Such experiments were performed on 5 titanium-based alloys exhibiting quite different mechanical behaviors and one NiTi alloy for comparison. For each alloy, several thermomechanical treatments were also investigated in order to understand their effects on the SIM transformation. A special attention was brougth to a new alloy developed recently in our lab, which exhibits a very high superelasticity in comparison with more conventional β titanium alloys. Data are being analyzed and first results show that experiments were successfully performed. The obtained results are expected to bring new highligths about the SIM transformation in superelastic β titanium alloys. At least three publications are expected from these experiments.