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X-ray measurements of the self-organization of martensitic variants during thermal cycling DANIEL PEREZ, University of Ottawa, MARK SUTTON, McGill University, MICHAEL ROGERS, University of Ottawa — The deformation of most types of metals involves an irreversible flow of crystallographic dislocations. This allows for their ductility. The deformation of a metallic shape memory alloy (SMA), on the other hand, is accommodated by a solid-solid phase transition. If deformed in the low-temperature martensitic phase, an SMA can be returned to its original shape by raising its temperature to the point where it changes back to its high-temperature parent phase. When the reverse occurs and the transformation is from parent to martensitic phase, an SMA goes from a high-symmetry to a low-symmetry state in which a number of martensitic variants are produced. We monitored the self-organization of these variants during cycles of periodic thermal driving. This was done using in situ X-ray Photon Correlation Scectroscopy (XPCS), which uses correlation from X-ray speckle to quantify the degree of microstructural change in a material. Our measurements revealed enhanced reversibility in the organization of the martensitic variants as the system evolved during repeated thermal cycling.

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