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Fermi Surface as a Driver for the Shape-Memory Effect in AuZn

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Martensites are materials that undergo diffusionless, solid-state transitions. The martensitic transition yields properties that depend on the history of the material and if reversible can allow it to recover its previous shape after plastic deformation. This is known as the shape-memory effect (SME). We have succeeded in identifying the operative electronic mechanism responsible for the martensitic transition in the shape-memory alloy AuZn by using Fermi-surface measurements (de Haas-van Alphen oscillations) and band-structure calculations. Our findings suggest that electronic band structure gives rise to special features on the Fermi surface that is important to consider in the design of SME alloys.