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Magnetic Order in the Spin Chain Antiferromagnet Ca3Co2O6

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— We have used powder neutron diffraction to investigate the magnetic structure of the Ising spin chain compound $Ca_3Co_2O_6$. Our investigation focuses on the low-temperature regime ($T < 14$ K $<< T_N = 25$ K) where previous neutron diffraction studies have shown that there is an increasing instability in the spin density wave (SDW) order within this material. The results of this work reveal that there is an order-order transition from the SDW structure to a new commensurate antiferromagnetic phase. The extraordinary time dependence of the magnetic reflections demonstrates that this transition occurs via a very slow transformation process. As the temperature is reduced the characteristic time of the transition process increases rapidly and at low temperatures the magnetic states become frozen. We have also investigated the stability of the low-temperature commensurate phase in an applied magnetic field.

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