Chemical solution-deposited $BaTiO_3$ thin films on Ni foils: Microstructure and interfaces

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Abstract: The microstructure and interface quality of chemical solution-deposited $BaTiO_3$ films on Ni foil were investigated by transmission electron microscopy. The microstructures were found to consist of equiaxed and uniform grains, with average grain sizes for rapid thermal-annealed films of 12 nm (700°C) and 18 nm (750°C), respectively. Films furnace annealed at 1000°C after a rapid thermal anneal at 700°C showed a grain size of 42 nm. It is believed that the final grain size is limited by the highly reducing atmosphere and also by the existence of well-developed crystallites resulting from the rapid thermal annealing step. Spatially resolved electron energy loss spectroscopy identified the existence of residual carbon and variations in the oxygen content in $BaTiO_3$ films. High-resolution transmission electron microscopy revealed an interfacial layer of Ni-Ba alloy (5-10 nm thick) between the $BaTiO_3$ and Ni foil.