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Epitaxial growth of single crystal CoGa is investigated in-situ using reflection high energy electron diffraction(RHEED). The formation of different phases of CoGa(different stoichiometric compounds and epitaxial orientation) due to various initial growth conditions has been probed with X-ray diffraction and correlated with the RHEED patterns. The growth of (100)CoGa or (110)CoGa is found strongly dependent on the termination of the GaAs surface, with either Co or Ga, before the epitaxial deposition of CoGa. When the flux ratio is deviated from the proper stoichiometric range, additional Co-Ga-As compounds are found in the X-ray diffraction measurement. It is concluded that the CoGa phases and orientations can be determined by pre-deposition of Co or Ga with a control of stoichiometry in the proper range. The high quality epitaxial CoGa has potential applications in thermodynamically stable contacts, and more importantly for fabrication of GaAs/metal/GaAs quantum well structures.