Qualitative and quantitative analysis of precipitate phases in nickel-based corrosion resistant alloys with different isothermal situation

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Abstract：The capability of nickel-based corrosion resistant alloy is mostly influenced by the quantity, composition, size, distribution of precipitate phase in alloy. After isothermal treatment, tnickel-based corrosion resistant alloy undergoes various decomposition processes which could form precipitates of inter-metallic phase and carbides. It is well known that these precipitates lead to a reduction in creep ductility and adversely affect the toughness and corrosion property. In present paper, qualitative and quantitative analyses of precipitate phases were carried out and the analytical procedure has been established. After choosing electrolyte and electrolytic system, electrolytic isolation was performed to extract precipitates from matrix.,The residues were collected by ultrasonic cleaning and filtration after galvanostatic electrolysis. Scanning electron microscope (SEM) and X-ray diffraction (XRD) were used to examine their structure, modality and size. The contents and elemental compositions of different precipitate phase were calculated by Rietveld method. Furthermore, the relation between percent of precipitate phase and capability of corrosion resistant was discussed. Our experiments demonstrated that the most of precipitate phase was formed at 900 ℃. For the precipitate phases at 900 ℃ with different aging time, the content and size showed significant increasing trend with the prolonging of aging time. The results of corrosion evaluation also showed the strong relativity between percent of precipitate phase and capability of corrosion resistant: with the increase of percent of precipitate phase, the average corrosion rate of material was also raised and the corrosion resistant capability of material was declined.