

Synthesis of Co diffused Cu for Mössbauer source

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1. Introduction

The most frequently used techniques for the preparation of ^{57}Co Mössbauer sources comprise a deposition of the radioisotope onto the surface of a selected metal matrix followed by thermal diffusion of the deposition into the metal lattice [1]. The thermal annealing of different metal matrices (Cu, Au, Fe, Co and Pt) with electrodeposited ^{57}Co described by Stephen [1] was performed. An optimized electro deposition process of carrier-free ^{57}Co onto the rhodium foil was described earlier.

2. Experimental Results

Cobalt (Co) coatings were deposited by DC electroplating at current densities of 20 mA/cm². The thermal annealing of Cu with electrodeposited Co was performed in a continuously pumped vacuum furnace (10⁻⁴–10⁻⁵ hPa) at temperatures of 800–1000 °C for 2h.

3. Results and discussion

Co deposition was produced at a current density of 20 mA/cm², a bath temperature of 27 °C, a pH level 1.89. XRD patterns showed that the crystal structure of the coating is pure fcc cobalt, and no characteristic peaks of other phases have been recorded. The Co diffused Cu matrix at annealing at and above 1000 °C, which is near temperature of Cu (1050 °C). The diffusion of Co were measured by mapping of EDS.

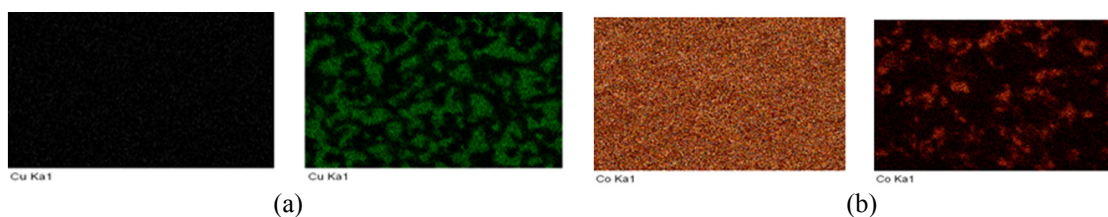


Fig. 1. Mapping of EDS images for (a) pre-annealed Co/Cu and (b) annealed Co/Cu

4. Conclusion

For the deposition of Co nanoparticles, nanocrystalline cobalt (Co) coatings were synthesized using DC electrodeposition. Co diffused in to Cu matrix at temperature of 1,000 °C.

5. Reference

- [1] J. Stephen, An electrolytic method of preparing Mössbauer Sources and absorbers, Nuclear Instruments and methods, 26, 269(1964).