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Influence of nickel and aluminum additions on the microstructure and tensile properties of innovative, free-carbon, 10% cobalt maraging composite steel

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Good combinations between strength and toughness are always the aim of all researchers working in the field of material science. Maraging steel grades (200-300) are one of the well known steel alloys proved to have good strength and toughness and are known as 18%Ni-Co-Mo steel family. Maraging steels production, import, and export by certain countries such as USA is closely monitored by international authorities because it is particularly suited for use in gas centrifuges used for uranium enrichment and in aviation technology. In this research an effort is paid to produce innovative carbon-free maraging steel alloy composites that can compete the well known 18%Ni-8%Co standard (250-300) maraging steel alloy with higher strength and superior toughness. The experimental maraging steel composites having different Ni (18-25%)-and Al (0.5-1.5%) together with or without Ti and Mo contents are produced by consolidation from the nano-elemental powders. The mechanism of strengthening in Iron- Nickel- Cobalt-Aluminum composite alloys is studied, however, the changes in microstructures after solution treatment and aging-heat treatment are emphasized using metallurgical microscopy and SEM-TEM aided with EDX analyzing unit. The effect of induced deformation on the properties of the as-sintered samples is also studied. Fracture toughness, impact toughness, hardness, and strength are measured for all alloy composites under investigation and compared with the standard nominal properties for conventional maraging series (250-300).

Biography

Prof. Dr. Saied Elghazaly is working with steel technology group at the central metallurgical R&D Institute, Cairo-Egypt since 1974. He has a wide experience in the field of steel alloys especially stainless, tool, and high alloy steels produced through conventional or powder metallurgy routes.

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