Contribution ID: **151** Contribution code: **S11-EPASE-212** Type: **Poster presentation**

Synthesis and Characterization of Mg2Si and Al doped Mg2Si formed by Pack Cementation process

Monday, 29 August 2022 18:00 (1h 30m)

Increased energy consumption worldwide, combined with reduced energy reserves and environmental protection, leads to the necessity of alternative sustainable energy generation methods such as thermoelectric energy conversion. In last few decades, considerable research effort has been concentrated to develop materials which can be used to transform heat into electric power. These materials have been considered as a potential environment-friendly high performance thermoelectric material. Metal silicides are promising thermoelectric materials and characterized by low resistance, high thermoelectric figure of merit ZT, low density, high melting point, thermal stability, low toxicity and fabrication cost. A variety of techniques have been used to prepare silicides, as ball milling, solid state reaction, sputtering, reactive deposition epitaxy. Here, a new environmental friendly, low cost and simple technique, thermochemical diffusion process (pack cementation) was used to synthesize Magnesium silicide (Mg2Si) and Al doped Mg2Si [1,2]. Magnesium silicide is a prospective narrow gap semiconductor for thermoelectric energy conversion at high temperatures. The current study focuses on the fabrication of new thermoelectric materials, aiming towards the development of compounds with advanced thermoelectric properties. For this process a powder mixture which contains Si powder Mg (donor material), Al (doping) and a halide salt which is the chemical activator are packed and sealed in a ceramic. The sealed crucible is then heated in an electric furnace under Ar atmosphere. A series of experiments were carried out at temperatures ranging from 450oC to 650oC at different durations from 120min to 240min to compose Mg2Si and Al doped Mg2Si thermoelectric powders [3]. The morphology and the chemical composition were determined by SEM equipped with EDS analyzer, the phase identification was performed using XRD analysis, the chemical state was identified via XPS and the oxidation resistance of silicides was investigated by TGA.

References

1. D. Stathokostopoulos et al, Results in Materials 13, 100252, (2022)
2. D. Stathokostopoulos et al, Appl. Surf. Sci. 285P, 417-424, (2013)
3. D. Stathokostopoulos et al, J Therm. Anal. Calorim. 121, 169-175, (2015)

Primary authors: Dr STATHOKOSTOPOULOS , Dimitrios (Laboratory of Advanced Materials & Devices, Department of Physics, Aristotle University of Thessaloniki, GR 54124, Thessaloniki, Greece); Dr KARFARIDIS, Dimitrios (Laboratory of Advanced Materials & Devices, Department of Physics, Aristotle University of Thessaloniki, GR 54124, Thessaloniki, Greece); Prof. VOURLIAS, George (Laboratory of Advanced Materials & Devices, Department of Physics, Aristotle University of Thessaloniki, GR 54124, Thessaloniki, Greece); Prof. CHRISSAFIS, Konstantinos (Laboratory of Advanced Materials & Devices, Department of Physics, Aristotle University of Thessaloniki, GR 54124, Thessaloniki, Greece)

Presenter: Dr STATHOKOSTOPOULOS , Dimitrios (Laboratory of Advanced Materials & Devices, Department of Physics, Aristotle University of Thessaloniki, GR 54124, Thessaloniki, Greece)

Session Classification: Poster session

Track Classification: Scientific Sections: S11 Environmental Physics – Alternative Sources of En-

ergy