# Locally Resonant Nanophononic Metamaterials for High Efficiency Thermoelectric Energy Conversion

**PI: Michel Kazan** [1]
**CO PI: Malek Tabbal** [1]**, Digambara Patra** [2]

1. Department of Physics
2. Department of Chemistry

# Locally Resonant Nanophononic Metamaterials for High Efficiency Thermoelectric Energy Conversion

In this project we intend to design nanophononic metamaterials in which local resonance induces strong reduction in the lattice thermal conductivity. Such systems are expected to show high thermoelectric figure of merit and contribute significantly to the efforts done so far to develop alternative energy technologies. We will be working on a configuration based on a thermoelectric thin film with a periodic array of nanostructures erected on the free surface. This configuration qualitatively alters the base thin-film phonon spectrum due to a hybridization mechanism between the nanostructures local resonances and the underlying atomic lattice dispersion. Although the metamaterial will contain more phonon modes than the thin film, its phonon curves can be flattened out to yield very low thermal conductivity and a thermoelectric energy conversion efficiency much higher than those that are currently in use.