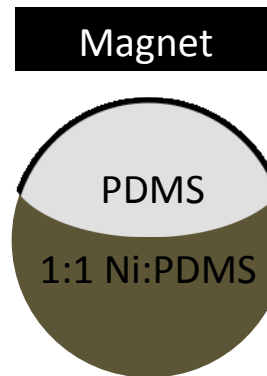


Lab #8 Doping

Self-Assembly

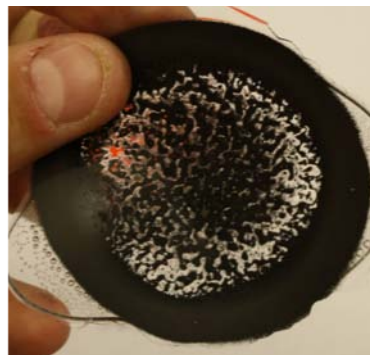
Molecular self-assembly is the spontaneous association of molecules under equilibrium conditions into stable, structurally well defined aggregates joined by non-covalent bonds.

Whitesides et al. Science 254 1312 (1991)



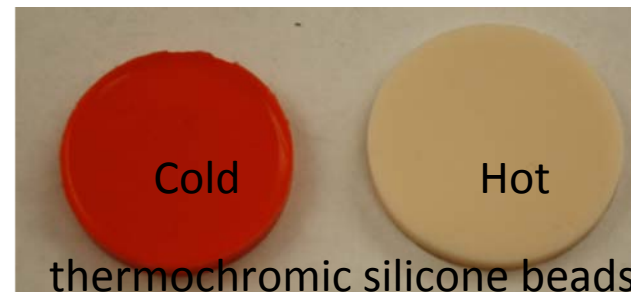
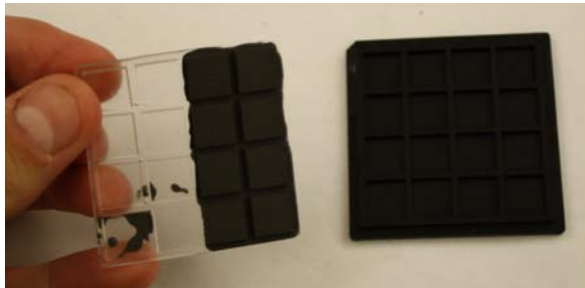
Ni-doped PDMS Ping Pong Ball

Photo courtesy of [kenteegardin](#) on Flickr.



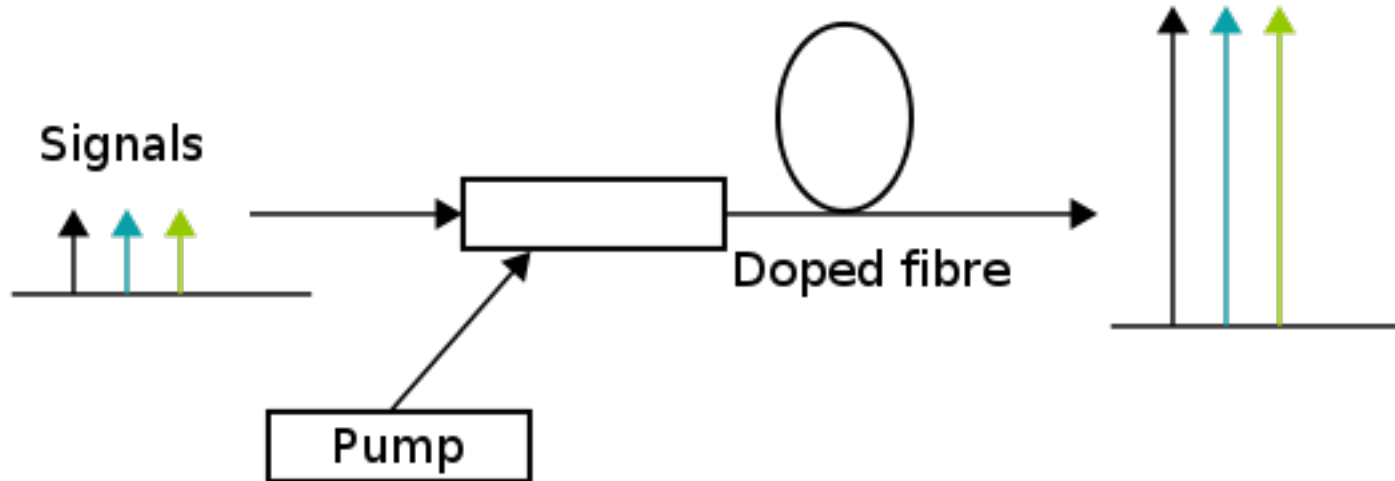
Material Properties

1. PDMS
2. 1:1 Ni powder + PDMS
3. 4:1 Ni powder + PDMS
4. Thermochromic silicone beads + PDMS



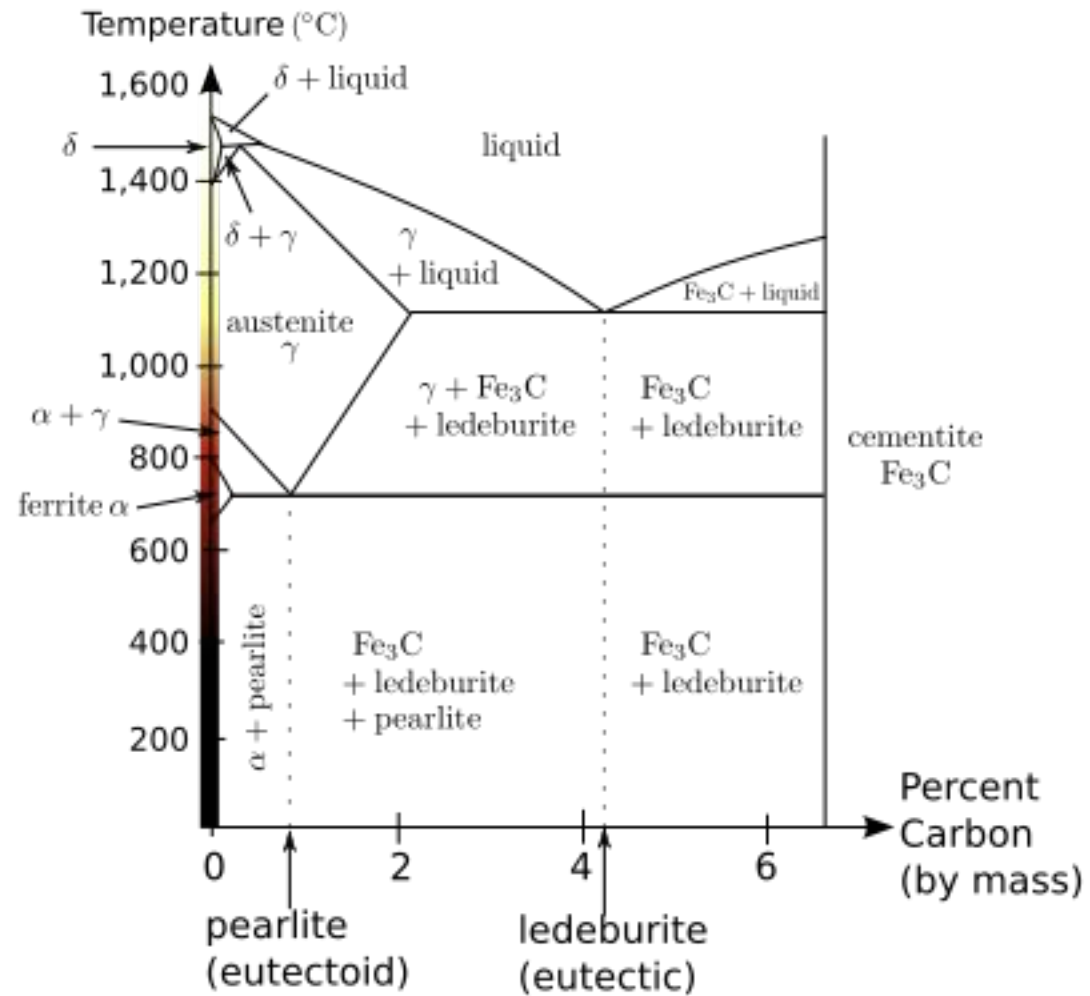
- Compare stiffness
- Compare reflectivity
- Compare electrical resistivity using multimeter
- Compare thermal conductivity using thermochromic silicone beads

Er-doped Fiber Amplifier



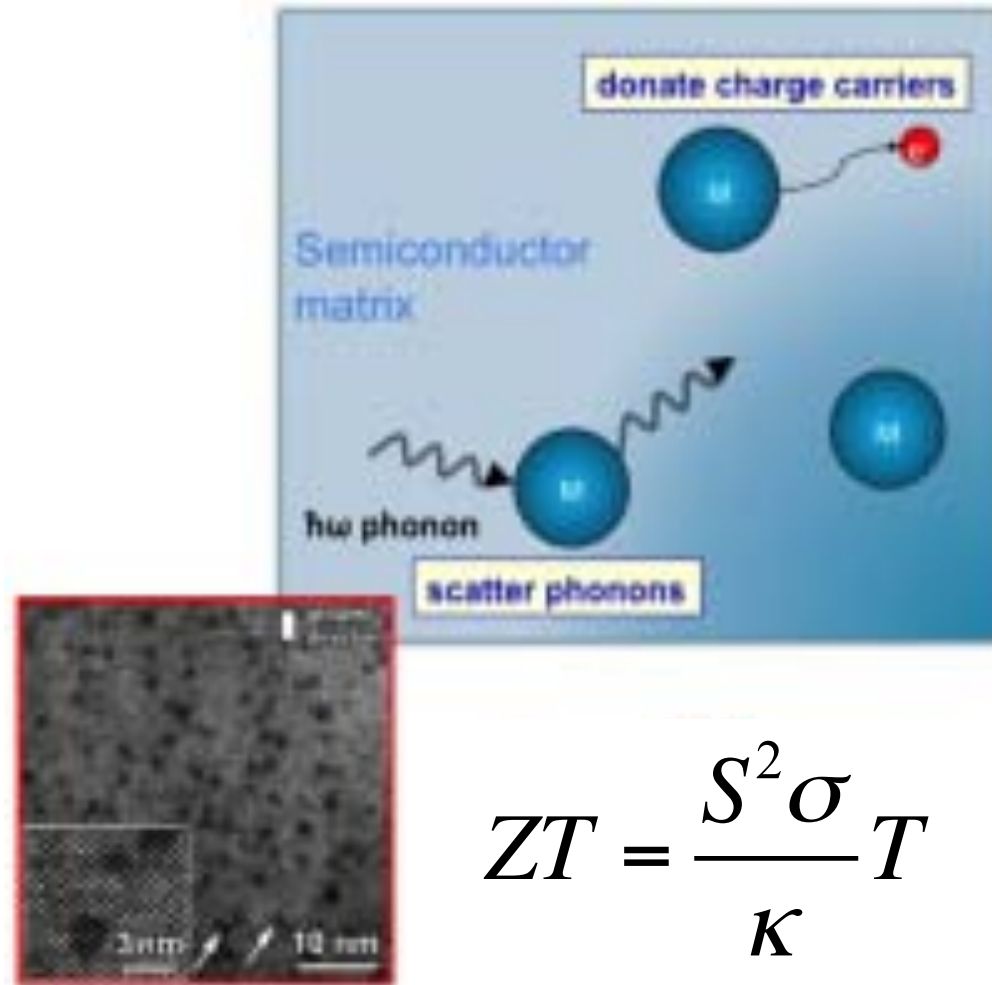
Amplification is achieved by stimulated emission of photons from dopant ions in the doped fiber. The pump laser excites ions into a higher energy from where they can decay via stimulated emission of a photon at the signal wavelength back to a lower energy level. The excited ions can also decay spontaneously or even through nonradiative processes involving interactions with phonons of the glass matrix. These last two decay mechanisms compete with stimulated emission reducing the efficiency of light amplification.

Steel



H\]g']a U[Y']g']b' h Y' di V']WXca U]]b"

Nanoparticles in Thermoelectrics



$$ZT = \frac{S^2 \sigma}{K} T$$

7ci fhYgmicZCdhcY'YVfcb]Vg FYgYUfW ; fci d'UhI 7 'GubHJ'6UFVUFU"l gYX'k]h' dYfa]gg]cb"

Schematic of the properties that embedded nanoparticles introduce within a semiconductor matrix, including phonon scattering and donating charge carriers.

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