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Theoretical modeling of critical temperature increase in metamaterial superconductors[1] IGOR SMOLYANINOV, University of Maryland, VERA SMOLYANINOVA, Towson University — Recent experiments have demonstrated that the metamaterial approach is capable of drastic increase of the critical temperature Tc of epsilon near zero (ENZ) metamaterial superconductors. For example, tripling of the critical temperature has been observed in Al-Al2O3 ENZ core-shell metamaterials. Here, we perform theoretical modelling of Tc increase in metamaterial superconductors based on the Maxwell-Garnett approximation of their dielectric response function. Good agreement is demonstrated between theoretical modelling and experimental results in both aluminum and tin-based metamaterials. Taking advantage of the demonstrated success of this model, the critical temperature of hypothetic niobium, MgB2 and H2S-based metamaterial superconductors is evaluated. The MgB2-based metamaterial superconductors are projected to reach the liquid nitrogen temperature range. In the case of an H2S-based metamaterial Tc appears to reach ˜250 K.

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