



Fig. 5. Simulated amplitude transmission spectra (a), Q factor for different degrees of asymmetry (b). The red curve is just to guide the eye and blue curve is an exponential fit to the declining Q factor with increasing asymmetry.

Hence, ASR metamaterials with a weak asymmetry are likely to hold great potential for the use in tunable filters. Small changes in the local environment of the asymmetric SRR metamaterial supporting the Fano resonance would induce dramatic resonance frequency shifts. If those ASRs are fabricated on a substrate with gain, then the current oscillations at the Fano resonance frequency could lead to a very narrow band coherent terahertz radiation source following the concept of the lasing spaser [2–5].

5. Conclusion

In conclusion, we have experimentally and numerically shown that planar terahertz metamaterials with a small structural asymmetry can exhibit sharp Fano resonances. Theoretically Q factors of 50 can be achieved. These structures can have a multitude of applications including notch filters and highly selective narrowband THz emitters as well as highly sensitive terahertz based sensors for chemicals or bioagents.

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