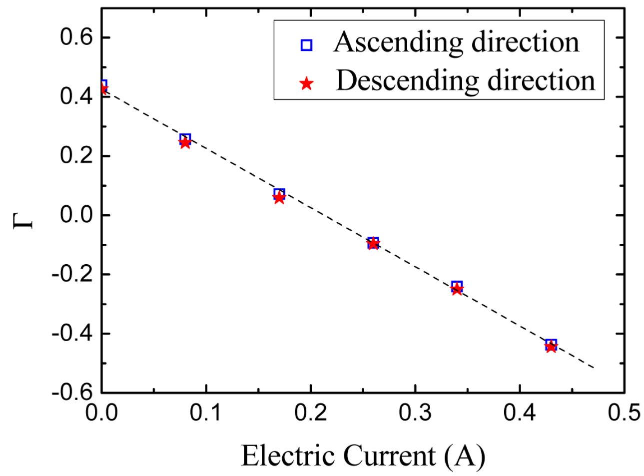


Fig. 6. $\Gamma$ dependence on electric current in the wavelength of 1543 nm under 2 mT perpendicular magnetic fields in ascending and descending directions. The curve represents the linear fitting of the data.

To make our MC sensor practical to a real environment, we need to package the MC and the Al wire into a small glass tube, and seal both ends of the tube. Then the device can be well protected to avoid damaging and the influence of air flow.

Moreover, temperature stability is another key issue for practical applications. Two methods can be adopted. The first is that we could utilize a second microfiber device which is sensitive to ambient temperature to realize temperature compensation. Inevitably it could make the system more complicated. The second method is to utilize specialized polymer film with negative thermal-optic coefficient to coat the MC. At a special diameter of the coupler, the negative thermo-optic effect can compensate other thermal effects to counteract the temperature influence as much as possible.

## 4. Conclusion

In this work, a new kind of MC based differential twin receiving fiber-optic magnetic field and electric current sensor is proposed. It takes advantages of the influences of the Lorentz force induced by the magnetic field and the thermal expansion caused by the electric current when electric current flows through the metal Al wire. The sensor is low-cost and easy to be fabricated, without any intrinsic magnetic hysteresis and saturation effect. The sensor utilizes the ratio of the difference to the sum of the output signals from the twin-output ports. This approach eliminates the dependence on the perturbation of incident light power. Using our proposed sensor, we measured a magnetic field sensitivity of ~0.0496 $mT^{-1}$, current sensitivity of ~1.0899 $A^{-1}$ without any magnetic field, with good repeatability.

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