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**Anisotropic magnetoresistance and tunneling magnetoresistance of conducting filaments in NiO with different resistance states** DIYANG ZHAO, SHUANG QIAO, YUXIANG LUO, AITIAN CHEN, PENGFEI ZHANG, Tsinghua University, PING ZHENG, Chinese Academy of Sciences, ZHONG SUN, MINGHUA GUO, Tsinghua University, F. -K. CHIANG, Chinese Academy of Sciences, JIAN WU, Tsinghua University, JIANLIN LUO, JIANQI LI, Chinese Academy of Sciences, YAYU WANG, YONGGANG ZHAO, Tsinghua University, TSINGHUA UNIVERSITY TEAM, CHINESE ACADEMY OF SCIENCES COLLABORATION — Resistive switching (RS) effect in conductor/insulator/conductor thin-film stacks has attracted much attention due to its interesting physics and potentials for applications. NiO is one of the most representative systems and its RS effect has been generally explained by the formation and rupture of Ni related conducting filaments, which are very unique since they are formed by electric forming process. We study the MR behaviors in NiO RS films with different resistance states. Rich and interesting MR behaviors were observed, including the normal and anomalous anisotropic magnetoresistance (AMR) and tunneling magnetoresistance (TMR), etc., which provide new insights into the nature of the filaments and their evolution in the resistive switching process. First-principles calculation reveals the essential role of oxygen migration into the filaments during the RESET process and can account for the experimental results. Our work provides a new avenue for the exploration of the conducting filaments in RS materials, and is significant for understanding the RS mechanism as well as multifunctional device design.

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