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| **Abstract:** |  |
| Reliable and highly sensitive flexible physical sensors hold great potential for applications in emerging technologies. Among others, of particular importance is to embed the sensor into operations at the hazardous fields, like radioactive zones or nuclear power plants. However, a significant challenge is to develop the radiation tolerant flexible sensors with stable performance under extreme conditions. This study presents a flexible pressure–temperature sensor based on MXene/Fe3O4/graphene porous network/Ecoflex (MFGPNE) and thoroughly investigates the effect of a high dose of *γ*-irradiation on their physical and electrical properties. The proposed sensors are characterized by a 4.71 kPa−1 sensitivity to the applied pressure in the range of 0–62.5 kPa and by a 2.23% resistance change per degree in the temperature range of 21–110 °C. The in situ electrical experiments, performed during irradiation of the MFGPNE sensor by 20 kGy of *γ*-rays (60Co), reveal the stable and reliable operation of the sensor. Superior radiation stability and pressure–temperature sensitivity are achieved due to the inherent nature of the materials and the sophisticated design of the proposed sensors. Moreover, an MFGPNE sensor based prototype gripper for grasping force control by remote monitoring of the press and lift forces demonstrates the application of the proposed sensor**.** | |