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A Fast Chemiresistive H_2 Gas Sensor Based on Sputter Grown Nanocrystalline P-TiO_2 Thin Film Decorated with Catalytic Pd-Pt Layer on P-Si Substrate

Authors : Jyoti Jaiswal, Satyendra Mourya, Gaurav Malik, Ramesh Chandra

Abstract : In the present work, we have fabricated and studied a resistive H_2 gas sensor based on Pd-Pt decorated room temperature sputter grown nanocrystalline porous titanium dioxide (p-TiO_2) thin film on porous silicon (p-Si) substrate for fast H_2 detection. The gas sensing performance of Pd-Pt/p-TiO_2/p-Si sensing electrode towards H_2 gas under low (10-500 ppm) detection limit and operating temperature regime (25-200 °C) was discussed. The sensor is highly sensitive even at room temperature, with response (Ra/Rg) reaching ~102 for 500 ppm H_2 in dry air and its capability of sensing H_2 concentrations as low as ~10 ppm was demonstrated. At elevated temperature of 200 ℃, the response reached more than ~103 for 500 ppm H_2. Overall the fabricated resistive gas sensor exhibited high selectivity, good sensing response, and fast response/recovery time with good stability towards H_2.

Keywords : sputtering, porous silicon (p-Si), TiO_2 thin film, hydrogen gas sensor
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