Threshold hyperon production at COSY-11

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At the COSY-11 installation, an internal experiment at the COoler SYnchroton and storage ring COSY Juelich, the Σ^0 and Λ hyperon production near the kinematical threshold was studied in $pp \to pK^+\Lambda/\Sigma^0$ reactions. Data points were taken in the excess energy range between 0.68 MeV and 59.3 MeV for Λ (2.8 MeV and 59.1 MeV for Σ^0) [1-3] resulting in threshold excitation functions of high accuracy.

The cross section ratio $\sigma(pp \to pK^+\Lambda)/\sigma(pp \to pK^+\Sigma^0)$ shows an unexpected behavior. Below excess energies of about 15 MeV it was measured to be about 28 in contrast to a value of about 2.5 determined for higher excess energies ($Q \geq 300MeV$) [4] in good agreement with the Λ/Σ^0 isospin relation, which is 3. To explain this unexpected threshold behaviour, various theoretical scenarios within meson exchange models were proposed [5-7]. Although the various descriptions differ even in the dominant basic reaction mechanism, all more or less reproduce the trend of an increase in the cross section ratio in the threshold region. The present data are not sufficient to definitely exclude possible explanations. Further studies e.g. on the other isospin projections will help to understand the threshold hyperon production. Therefore the Σ^+ production was measured at the COSY-11 installation via the $pp \to nK^+\Sigma^+$ at Q = 13 MeV and Q = 60 MeV [8]. The Σ^+ hyperon was identified via the missing mass technique by detecting the remaining reaction products - K^+ and neutron.

The status of the current analysis will be presented and discussed.

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